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A MANUAL

OF

OBSTETRI

Theoretical and Practical.

BY

W. TYLER SMITH, M.D

MEMBER OF THE ROYAL COLLEGE OF PHYSICIANS;
PHYSICIAN ACCOUCHEUR TO, AND LECTURER ON MIDWIFER
ST. MARY'S HOSPITAL.

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Illustrated with 185 Engravings.

LONDON:
JOHN CHURCHILL, NEW BURLINGTON
MDCCCLVIII.

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1858

PREFACE.

THE present Volume consists of the substance of a Course of Lectures which appeared in the *Lancet* in the year 1856. It has always been my custom to lecture either extemporaneously or from brief notes; so that when in the autumn of 1855 I was asked to publish a Course on Obstetrics, I had but little time for preparation, and, with few exceptions, the whole was written in the year 1856. This, with the busy avocations of practice, involved no slight amount of labour, and may plead as some excuse for any shortcomings which may be evident to the critical reader.

I was subsequently invited by Mr. Churchill to re-cast the Lectures into the form of a Manual, as one of his Series; and I willingly consented to do this, feeling there could be no higher object for a professional man than that of being as extensively useful as possible. I have been able to spare less time than I could have wished for this task, but I trust that some originality will be found in the work, and that it will contribute, in the hands of the student and practitioner, to the advancement of that branch of medicine of which it treats.

When I began to publish, I determined to give the authority for every woodcut taken from other works; I soon found, however, that obstetric authors, of all of Mauriceau downwards, had copie without acknowledgment, as to render to trace the originals. I therefore re must content myself by stating that I present work upwards of twenty new stock.

I have to express my acknowledg practitioners who have furnished m cases, and especially I desire to m received from my friends Dr. Matt and Dr. Vernon.

UPPER GROSVENOR-STREET,
April 19th, 1858.

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MANUAL
OF
OBSTETRI

INTRODUCTION.

THE knowledge of the modes of generati
animals, of the anatomy and physiology of the
in reproduction in the human female, of the
the embryo, and the pathological lesions to w
and ovum are liable, with the rules of pract
observation and experience, constitute the fo
SCIENCE OF OBSTETRICS. On the other ha
MIDWIFERY consists of the application of
extensively derived, in the prevention and
accidents and diseases incident to pregnancy,
the puerperal state. The object of both sci
the assurance of the safety of mother and of
several conditions; and it adds to the importan
of medicine, that if any comparison of the valu
life with another can properly be made, none i
than that of the woman in childbirth; for at n
the lives of two human beings be so closely uni
have also an important relation to morals, sin
happens, in the casualties of gestation and l
lives of the mother and child come to some c
petition, and the decision upon which the de
rests, with a view to the safety of the mother
by the accoucheur. These various consider
than the scope of the subject itself, should iml
be engaged in the study and practice of this
medicine with a sense of the responsibility u
lie, to neglect no means of information which
to make them sound and efficient practitioners

In the Arrangement of the matter of
an attempt has been made to follow a natu
those subjects which mutually illustrate e
as possible in juxtaposition. For instance,
of the pelvis and the fœtal cranium at th
these subjects have been treated of imm
mechanism of labour, with which they are
cerned. In like manner, the deformities of t
considered in the chapters preceding the
labour from pelvic distortion. Indeed, t
losing sight of a certain order or devel
been thought of the mutual dependence
jects upon each other, than of a strictly sy
proceeding.

By way of conclusion, the various cau
Childbirth have been grouped together and
means by which we may reasonably hope
mortality, both as regards the mother an
siderably diminished hereafter, have been

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CHAPTER I.

GENERATION.

In this the first chapter of a work on the Principles aı tice of Obstetrics, it is proposed to draw attention general considerations concerning the reproduction aı lopment of living beings. Beginning with matters rel the most simple modes by which the propagation of can be effected, we may easily ascend to the study of tb forms of reproduction, until we arrive at the generatic human species. It will be found, as we proceed, tb are no races so low in the scale of creation but that tory of their generative phenomena is calculated t light upon the same functions in classes of the high in the animal kingdom. This circumstance must ple excuse for attempting to deal, at the commencemen present work, with the elements or principles of gene

At the very threshold of the subject, we are me long-agitated question of Spontaneous or Equivoca ration. Can any form of animal life be produced ı globe we inhabit, out of dead inanimate matter, or, otherwise than as part of a procession or series o organisms, every generation of which must depend existence upon the generations that have preceded former times, many facts connected with the generatic humbler forms of living matter seemed altogether inex and naturalists and physiologists were driven to a l the doctrine that, under special circumstances, sucl decomposition of animal and vegetable structures, son lower forms of animal existence might be develope taneously. The progress of knowledge has, however, diminished the number of these mysteries; and it maı that, in recent days, the last stronghold of the beli spontaneous generation has been the conditions unde the Infusoria and Entozoa can be produced.

From any vegetable infusion, under certain regula regards light, air, and temperature, myriads of micrc infusoria are called into existence. The same infusi formly produce the same animalcules, and the lowest infusorial life are those which first appear. The result

same when water, which has been boile
and observers of eminence have declare
the *débris* of vegetable matter, while unde
transformed into infusoria. Others have
cules may be produced, by the action of
and similar inorganic matters. It may,
the present time, with regard to the i
culties in the way of explaining their alm
disappeared, and that their production,
circumstances, can be satisfactorily disp

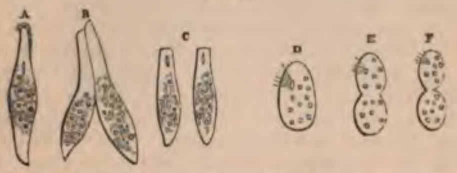
The different modes of propagation
been investigated, and it is known th
forms, the perfect infusoria, and in othe
almost innumerable, and of well nigh un
One animalcule, the *Monas crepuscul*
diameter; and it is remarked by Profes
drop of water may contain not less tha
of these minute beings. The drop
populations, greater in number than the
world, become dry, and preserve their
in the dust of the earth, to be revivifi
the conditions necessary to their exist
sunbeam but is peopled with these
Their power of resisting destructive
their least wonderful properties. T
ice, or enclosed in vesicles in the ice
some specimens of Rotifera after th
the sun for upwards of two years in dr
and Schultze have revived them after
Other animalcules, in drying, burst,
germs, which preserve their vitality u
ceivable circumstance. These and sim
particle of air, dust, or water can be s
contain infusoria or their germs, thus r
tain that the vegetable infusion does no
the restoration of dried animalcules,
their invisible germs. But the *experim*
the spontaneous generation of the inf
by Schwann and Schultze. The acces
contains infusoria or their germs, is k
the production of animalcules in vege
these experimenters passed the air e
potash and through strong sulphur

through iron tubes heated to redness, the infusions used having been previously boiled. Under these conditions no infusoria were produced, though a rapid development of animalcules occurred on the admission of air to similar infusions, when no such precautions were observed.

As regards the Entozoa, the presumptive evidence in favour of their spontaneous generation was still more conclusive than in the case of the infusoria. Entozoa are found in situations to which they could not be supposed to have access by any natural means, and particular entozoa are only met with in particular localities and organs. The *Cysticercus cellulosæ* is found in the anterior chamber of the eye, in the choroid plexus, and in the substance of the heart. The *Trichina spiralis* infests the voluntary muscles, and the *Strongylus gigas* the parenchyma of the kidney. A Diplostomum in the aqueous humour, has itself been found to be infested with parasitic animalcules. Entozoa have been detected in the fœtus in utero, in the blood, and in the eggs of oviparous animals. Such facts appeared to present insuperable difficulties to the explanation of the existence of entozoa in their special habitats, unless upon the supposition that they are produced spontaneously. It came also to be known that many of the higher forms of entozoa possess complicated organs of generation, and produce ova and embryos in abundance, which themselves became the subject of observation. For a time, however, this knowledge only increased the difficulty. How, for instance, could entozoa reach the fœtus, or enter the eye, when their ova were known to greatly exceed the diameter of the capillary vessels?

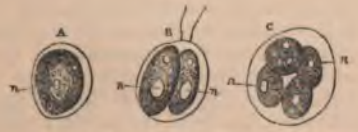
It was at last discovered, that the entozoa, particularly in their embryo forms, possess a special boring apparatus, which had been noticed by John Hunter in some species, by means of which they are able to make their way through the solid tissues of the body with extraordinary facility, producing little or no disturbance in their progress, and leaving no traces of their operations behind them. It was also found that a vast variety of special provisions existed for the diffusion and localization of these creatures. The numbers, too, of the ova of some of the entozoa are immense. A single specimen of the *Tænia serrata*, an entozoon which infests the dog, will produce twenty-five millions of ova! while a mature female of the *Ascaris lumbricoides* will contain upwards of sixty millions! Many of them pass through several phases of existence in unicellular, monadiform animalcules, is that of spontaneous fission, or Fissiparous Generation, as it is called. In this mode of reproduction, in the most simple forms of infusoria, a single unicellular animalcule divides into two or more cells, which, after their division, become similar to the parent cell. The first infusorial animalcule ever known, the *Vorticella convallaria,* discovered by Lœuwenhoeck nearly two hundred years ago, multiplies itself in this manner. Sometimes the fissure takes place longitudinally, at others transversely (Fig. 3), a notch first appearing at the point of subsequent division, which enlarges until the separation is nearly completed, when the two cells struggle, by means of their cilia, until they are free from each other, and swim off as independent animalcules. In some infusoria the fission consists in a simple division of one cell into two. In others, they divide but still remain connected in groups, as a chain or in a spherical mass. The latter is the case with the *Volvox globator,* a well-known animalcule. Instances are met with in which the divisions of succeeding generations are regular multiples of each other, as two, four, eight, and so on. This occurs, for instance, in the *Chlamydomonas.* (Fig. 4.) In the process of fission, the nucleus is

FIG. 3.



A, B, C. Longitudinal fission of elongated infusoria. D, E, F. Transverse fission of oval animalcules.

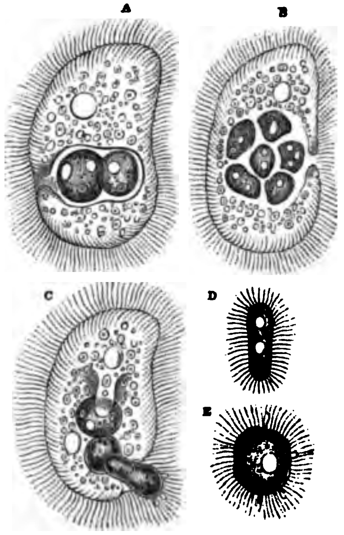
FIG. 4.



A, B, C. Multiple fission of Chlamydomonas. *n*. Nuclei.

of the parent supplies the gemmule, but, after a time, the young polyp begins to catch food, and contributes to the sup-

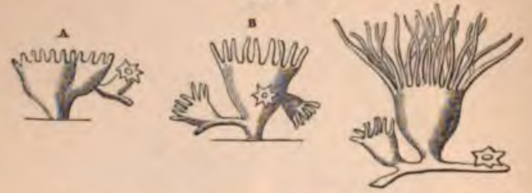
FIG. 5.



A, B. Formation of germs and embryos in Loxodes Bursaria. C. The process of parturition. D. E. Free, moving embryos.

port of itself and parent. At length, its connexion with the parent polyp becomes slender, and it separates altogether. (Fig. 6.) Another mode of gemmiparous generation is where, as in the sponges, small free gemmules, or buds, are separated from the body of the parent animal, and become developed into perfect individuals. The parts of the body from which gemmation takes place in different animals, are very various. In some, it may occur at any part of the surface of the body; in others, the gemmules are formed in the digestive cavity, and extruded from the oral aperture. In the medusæ, the gemmæ arise from the ovaries, stomach, proboscis, and tentacles. In other cases, as in the *Alcyonidium elegans*, an Alcyonian zoophyte, the tubercles which constitute the gemmæ, or buds, are produced in particular strips of tegumentary membrane. In some of the gemmiparous animals, new creatures may be multiplied to almost any extent by mechanical division. The *Hydra viridis* may be divided longitudinally or transversely into several parts, and each fragment will become a perfect polyp; or if a wound is made in the body of the animal, a new polyp sprouts from the site of injury. The gemmiparous form of generation is met with in a large variety of animals. It exists in the Infusoria, Entozoa, Polypi, Medusæ, Annulata, and Tunicata. In the Nereis, and in some of the Myriapoda, gemmation forms an important part of the reproductive process. In the former, a constriction first appears in the tail of the animal, immediately behind which the head of a new nereis is developed, and the posterior division becomes separated from the anterior, or parent nereis, as a perfect animal.

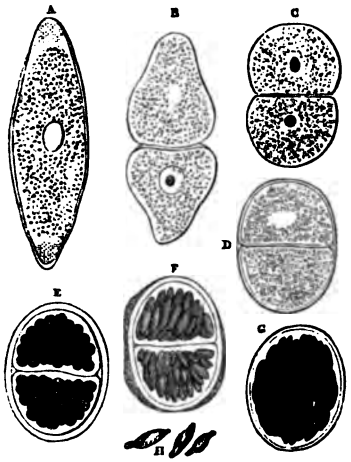
Fig. 6.



A, B, C. Polypoid Acalephs, giving off gemmæ or buds.

The earliest traces of a Diœcious mode of reproduction in animals, in which two individuals are engaged in the production of offspring, is met with in the humble Gregarina already mentioned, in what has been termed Conjugate Generation. These microscopical entozoa propagate not only by fission, but by a process termed conjugation. In the latter mode of generation, two of the elongated cells or animalcules are said by Stein and other observers to approach each other; the two ends which are in opposition become flattened, so that the two conjoined animalcules resemble a single Gregarina in shape. A complete fusion of the granular contents of the two individuals takes place, and from the joint mass a number of small bodies are produced, which are believed to be the embryos of this monadiform entozoon. (Fig. 7.) Other instances of conjugate generation have been observed by Kölliker, Siebold, and Cohn. This mode of generation appears to be quite wanting in anything of an ordinary sexual character. The conjugating Gregarinæ appear to be precisely similar to each other, and their reproduction seems to be by a kind of duplicate fission. It is, however, impossible not to be struck with the similarity of the process of conjugation, and the union of the sperm cell and germ cell in the higher animals, to which sex has been added in the scheme of reproduction. In the latter case, the sperm and germ cells unite to produce, by division and subdivision, the particles forming the germ mass, out of which the embryo is evolved. As soon as sexual generation commences, two kinds of cells are required in the process of reproduction—one produced in the ovarium, the

FIG. 7.



Conjugation of Gregarinæ. A. Single Gregarina. B, C, D. Two animalcules in a state of conjugation. E, F, G. Formation of embryos. H. Free embryos.

is almost identical with the multiple fission of the Chlamydomonas—an analogy first pointed out by the late Dr. Martin Barry. The only difference is that in the Chlamydomonas and Gregarina the divisions and subdivisions produce independent and perfect animals; whereas in the mammalian ovum the fission results in a mass of germ cells, intended to pass on to higher developments. In animals the subjects of sexual generation, the male element is also formed by the rupture of the primary germ cells secreted by the testes, and the conversion of their nuclear matter into spermatozoa, which may, in fact, be considered as secondary germ cells. It may also be said that the human fabric is the result of the fission, an innumerable number of times repeated, of the single fertilized embryo cell; the multitudes of cells produced by the rupture and fission of generation after generation of cells, and by the conversion of their nuclei in turn into parent cells, being moulded by plastic morphological forces, into bone, muscle, nerve, blood, and the other elements of which the body is composed. The similarity of the ciliated epithelial cell of the mucous membranes, to the ciliated unicellular infusoria is very palpable. It is of myriads of such cells, modified in infinite ways, that the human organism is constructed. In this way we can to a certain extent realize the idea of Buffon, when he said that all animal and vegetable bodies were aggregations of animalcules; or the more positive remark of Oken, that the higher animals, and man himself, were agglomerations of infusoria.

Generation by means of buds or gemmæ is still more extensive than reproduction by fission. In gemmiparous animals reproductive nuclei are scattered throughout the structures and tissues of the parent organisms; it is a fission occurring, not, as it were, in the whole animal, but in particular parts. The mode of reproduction by gemmation extends higher than fissiparous generation, being found, as we have said, as high as the Tunicata, and it is concerned in that peculiar form of reproduction termed Alternate Generation, which is found amongst insects. But the principle of gemmation is not lost at the point when it ceases to be a mode of generation. It is concerned in the reproduction of lost parts. In gemmiparous generation, animals are formed, not from ova, or from the fission of primary reproductive cells, but from secondary or derivative germ cells, placed in reserve in the tissues of animals. In the triton, or the lobster, in which the tail or claw is reproduced, the new formation occurs from derivative germ cells placed in the tail or claw—that is, a reserve of derivative germ cells, not used in the general development, is deposited in different parts of the body, and come into use when regeneration follows the loss of particular parts or organs. In mammalia, the extremities in the fœtus are always formed by budding or gemmation. It is believed by some observers that in the human fœtus, if a limb be amputated spontaneously in utero, at an early period, there is an attempt at the production of a new limb by gemmation. In some of the remarkable cases of spontaneous amputation of limbs in utero, first investigated by Dr. Montgomery and Prof. Simpson, the amputated limb is found in the uterus, and from the stump, small or rudimentary fingers or toes are seen to be growing, which remain visible in after life.

One of the most remarkable phenomena in the history of reproduction is that of alternate generation, first investigated by Bonnet, Reaumur, Steenstrup, and others, and to which great significance has been given by Prof. Owen, under the name of Parthogenesis, or virgin-procreation. In many forms of animal life—as, for instance, in the Salpæ amongst mollusca, the Distomata amongst entozoa, and the Aphides amongst insects—it is found that the parent animal gives birth to an embryo different to itself; that this embryo lives as an independent animal, but gives birth, without sexual intercourse, to another, and to a successive series, until at length a progeny is formed bearing the likeness of the original parent.

The observations of Agassiz go to prove that the infusoria generally are only the ova of the entozoa, the polygastric animalcule being the larval condition of the parasitical worms. In the Distoma, the embryos have at first the form of ciliated monads, and these are metamorphosed into Gregariniform worms. In the interior of each of the latter, numbers of Cercariform, or tailed animalcules, are developed, which in turn become true Distomata. In the winged Aphis, the ova are deposited by the parent insect, and in due time produce larval, wingless aphides. Each virgin aphis of this brood will produce other similar broods, without contact with the male. This *Lucina sine concubitu* has been observed to go on to the eleventh generation, the last generation being winged, and male and female. These have intercourse, another fecundation occurs, and in the following summer the phenomena which have been described again occur.

The explanation of these cases is, that in the first instance the coïtus fertilizes the ovum, and part of the derivative germ cells produced from the embryo cell, instead of being consumed in the development of the first generation of aphides, are kept as a reserve. In the second generation, these derivative germ cells give origin to a new generation of derivative germinal cells, of which a reserve remains as before, and so on until the spermatic force of the germ cells is exhausted. To illustrate this matter, let us look to the early development of the mammalian ovum. The embryo cell divides into two, these two into four, the four into eight, and it is not until the segmentation has affected the whole mass of the germ and yolk that the formation of the new individual begins. But suppose each generation of germ cells, occurring in this fission or segmentation, to have the power of going on to the production of new individuals, we should then have the power observed in the virgin aphides, where each generation of germ cells goes on to the production of a larval aphis before a new fission or segmentation of the derivative germ cells takes place. We may see traces of this power of the spermatic element, to fertilize or modify more than one generation of ova and germ cells, in other animals than those in which perfect parthogenesis occurs. For instance, a single coïtus of the cock fertilizes, not only the eggs which are mature in the ovary, but those which are immature, so that eggs which reach maturity a long time after coïtus are found to be fertilized. The parthogenetic influence may, I think, even be seen in the mammalia and in the human female. In the well-known case of the mare covered by the Quagga, the foals produced afterwards, by intercourse with her own kind, still bore the stripes of the quagga. In the human female, it is found that a woman having married and borne children by her husband, becomes a widow, marries a second time, and bears children to her second husband which have the lineaments of her first husband. The same occurs in the lower animals, and it is difficult to explain the matter in any other way than by supposing that one coïtus must have influenced several generations of ova. The relation of such phenomena to parthogenesis is obvious.

The next step in the process of reproduction brings us to Oviparous Generation. This form of generation is very early met with in the animal series. Ehrenberg discovered in many of the Rotiferous animalcules distinct male and female organs,

ans of fecundated ova. In some of the
, ova appear to be formed in the general
ody without any sexual operation, and to
orm of reticulated masses. In the lower
al scale, oviparous generation is mixed up
l gemmiparous generation, and there seems
difference between the production of free
developed apart from the parent, and the
mination of ova from the infusoria, in whom
anting. It is in Insects, Fishes, Reptiles, and
arous generation reaches its full development
ova, which consist of a germinal vesicle, yol
d shelly coverings, are very small, and t
y extruded from the shell in a larval state,
ire its own nourishment, and passing thro
etamorphoses before it reaches the perfect
insects are diœcious, or of distinct sex, and
n of the ova occurs within the body of the fe
he sexes are also distinct, and in this class
commencement of the ovarium as it exists
rtebrata and mammalia. In the lower types o
um consists of a mere vascular lamina, in wh
formed and thrown off into the abdominal cavi
ey escape by orifices near the anal aperture.
specimens of this class an oviduct is adde
e of conveying the ova from the ovarium.
are generally impregnated out of the body, b
impregnation and development to a certain e
in the ovary, the male having a rudimentary
n, and the embryo is expelled in a living sta
oviduct is a permanent condition; the ov
undated out of the body, *in transitu*, in the
t in the more advanced specimens of thi
npregnated within the body of the female,
hem the young are born alive. In birds,
tained in ovaries, and the egg reaches its
development, consisting of the germinal v
yolk, an extensive layer of albumen, or whit
so as to support the development of the
membranes for the protection of the egg
of the ovum. Parental affection, of wh
and fishes, is present to a

In the Mammalia we have, in all cases, viviparous generation, though some are termed ovovivipara, but the instances of ovoviviparous generation in birds, amphibia, and fishes, in which the eggs are hatched in the body of the parents, are very different from any of the forms of generation met with in the mammalia. In the Monotrematous type there is a near approach to the bird; and as the phenomena of generation in the monotremes have not been actually observed, it is only by analogical reasoning that Prof. Owen has arrived at the conclusion that the Ornithorhyncus brings forth its young alive. In Marsupial reproduction, the impregnated ovum remains a short time in the uterus, and receives nourishment, but at a very early period of development it is transferred from the uterus to the marsupium or pouch, where it hangs by the nipple during the rest of its fœtal development. Neither in the monotremata nor the marsupiata have any vascular connexion between the parents and the ovum been observed. The uterus enlarges, but it is probably by a secretion found within its cavity, and absorbed by the yolk, that the young embryo is nourished and developed.

In the higher mammalia, a true vascular connexion is formed between the ovum and the mother by means of the chorion and the mucous membrane of the uterus; and the embryo, after a prolonged term of intra-uterine development, is expelled to pass through another protracted phase of maternal nutrition from the mammæ. In all mammalia, except in the very lowest types, we have the separation of the generative canal from the urinary and intestinal organs. The generative organs reach their greatest state of development in the human species, and consist of parts adapted to Coïtus, Ovulation, Menstruation, Impregnation, Utero-Gestation, Parturition, and Lactation—functions which are placed in relation to the highest affections, and the sacred sentiment of parental love. The vascular intra-uterine connexion between the mother and fœtus acquires its most perfect development in the Placenta of the human species, and it is mainly owing to this intimate vascular relation, the intricacy of the organs of generation, the arrangements of the bony pelvis in accordance with the upright position, and the development of the human intellect, as evidenced by the comparatively large size of the brain and cranium of the human fœtus, that the pains and perils of childbirth, and the necessity for the cultivation and practice of *OBSTETRICS*, are produced.

Having dealt thus far in general considerations, let us now proceed to a more minute consideration of the various steps in the anatomy, physiology, pathology, and therapeutics of reproduction, in the human species.

CHAPTER II.

THE EXTERNAL PARTS OF GENERATION.

The organs of Generation in the human female are genera
divided into the External, or those chiefly concerned in coït
and the Internal, or those employed in the development
the ovum. To the former belong the mons veneris, the l
majora and minora, the clitoris, the hymen or carunculæ
tiformes, the perinæum, the vagina, and the mammæ
latter includes the uterus and its ligaments, the Fall
tubes, and the ovaria. Both the internal and external
have important relations to the processes of utero-ge
and parturition.

The Mons Veneris is a cushion-like layer of adip
cellular tissue, developed at the time of puberty, sit
front of, and above, the pubis. It is covered by a
tegument, studded with hair. Its use is to guard
from mechanical violence during intercourse, and
the hair of the axilla in defending this part of the
the effects of friction and perspiration. In gene
of the mons is short and curled; but, in ster
have sometimes observed it to be straight,
shorter than usual—these conditions being oft
a feeble development of the internal organs of

The Labia Majora, or labia pudendi, are tw
ing downwards on each side from the mon
perinæum. They are thick, and lie in cor
below they become thinner and are sepa
other. Externally, the labia majora are cove
has a smaller quantity of hair upon it th
internally, they are lined with the com
genito-urinary mucous membrane, and
numerous sebaceous follicles, which
odorous matter. When this is allow

liness, to accumulate, it becomes of calcareous colour and hardness. The union of the labia above constitutes the superior commissure; and that below, the inferior commissure of the pudenda. Within the posterior commissure, a fold of mucous membrane stretches across between the labia, which has been called the fourchette, though the same name is frequently applied to the commissure itself, as the commencement of the perinæum. The fold, or frenulum referred to, is almost always lacerated in first labours; but before this laceration has taken place, and particularly during labour, a distinct depression, or fossa, can be felt between the frenulum and the edge of the perinæum, termed the fossa navicularis.

About an inch beneath the anterior commissure, and between the labia majora, is found the Clitoris, which resembles a small penis, and is, in fact, the analogue of the penis of the male. It is composed of two corpora cavernosa, which are attached by crura to the rami of the ischium and pubis, and meet together in the median line. Each of these bodies is enveloped in a thin fibrous sheath. The clitoris is imperforate, but at its point there is a small spongy or cavernous mass, called the glans, and covered by a fold of integument, or imperfect prepuce. It has two muscles—the erectores clitoridis, representing the erectores penis, arising from the rami of the pubis and ischium, as low down as the tuberosities, and inserted into the crura clitoridis. A suspensory ligament connects the clitoris with the pubis. It is supplied with blood by the internal pudic artery, and possesses a dorsal vein, similar to the vena dorsalis penis. The clitoris is capable of erection, and when in the erectile state is almost of cartilaginous hardness. It is the chief seat of sexual sensibility, constituting, according to Dr. Meigs, "the organ of touch to the aphrodisiac sense." In hysterical females, it is sometimes subject to a constant erection, almost similar to that which obtains in priapism in the male. During this condition, it is difficult, or impossible to pass urine—a point first noticed, I believe, by Dr. Silvester, of Clapham. These are, in fact, the cases in which, in hysterical subjects, the catheter is often required. I have observed the clitoris to be subject to a peculiar mechanical displacement, or dislocation, in females who have been the subjects of self-abuse. It becomes loose, probably from relaxation of the suspensory ligament, and is raised higher over the pubis than is natural. When such women marry, they are often deficient in the sexual

orgasm during coïtus, in consequence of the removal of the
clitoris from its proper position. The clitoris is larger, comparatively, and more prominent, in the infant than the adult.
It is subject to hypertrophy, but the special sense is not increased in such cases in proportion to the hypertrophic
growth. The clitoris receives large branches from the internal pudic nerves; and in some of the lower animals
Pacinian bodies have been found in this organ.

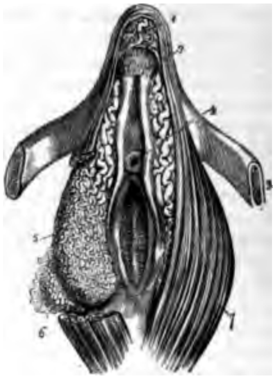
The Labia Minora, or nymphæ, are two folds of mucou
membrane extending from the prepuce of the clitoris, dow
wards and outwards, for about an inch and a half or t
inches. Externally there is a furrow betwixt these folds a
the labia majora, covered with the commencing muc
membrane, and studded with numerous fat-glands: and
ternally, they form the commencement of the vagina.
their inner surface may be seen the openings of num
mucous follicles, by which mucus is secreted for the lu
tion of the ostium vaginæ. The separated nymphæ
been compared to the fissured male urethra from a
development in hypospadia; and the analogues of t
and corpora spongiosa are found deeply seated bel
nymphæ. These consist of a plexus of veins lying
side of the clitoris, called the pars intermedia; an
leech-shaped masses of reticulated veins inclosed i
sheath. These bulbous masses were known to
anatomists, De Graaf and Santorini, but they hav
scribed anew by Mr. Guthrie, Kobelt, and others.
are situated below the pars intermedia, and behin
and lower portions of the nymphæ. They h
various names, such as plexus retiformes, bulbi
crura clitoridis interna. The objects both of th
and minora are, no doubt, to defend the gen
afford an extensive sexual surface, and to fa
pansion and dilatation of the pudenda during

Below the clitoris and between the nym
grooved space, about an inch long, pointed a
below, termed the Vestibule. In the med
the lower portion of the vestibule, is sit
Urinarius, consisting of a raised and irreg
membrane, with an opening in the middle.
caused by a slight puckering of the muco
contractile fibres which keep the meatu
circumstances, an arrangement

siderable distension during micturition, or in catheterism. The meatus is generally so prominent as to be readily felt by the experienced finger. (Fig. 9.)

Catheterism of the female bladder is one of the minor operations at which the accoucheur ought to be expert, and in this place a few remarks may be made on the mode of finding the urethra, and passing the catheter. We have to draw off the urine in the unimpregnated state; during pregnancy and labour, or after delivery; and also under certain circumstances in which the meatus and urethra may be considerably displaced. The situation of the meatus has already been indicated, and the length of the urethra is about an inch and a quarter. The meatus itself is on a level with the summit of the pubic arch, the bladder being in the natural condition above the pubis, and the direction of the urethra is backwards and upwards, or the same as the lower part of the anterior wall of the vagina, in which it is imbedded. The urethra may be felt rolling like a cord under the finger between the vaginal wall and the symphysis pubis.

FIG. 9.



1. Vena dorsalis. 2. Glans clitoridis 3. Crus clitoridis. 4. Meatus urinarius. 5. Bulbus vestibuli. 6. Vulvo-vaginal gland. 7. Sphincter vaginæ. The plexus of veins constituting the pars intermedia, is seen on each side of the nymphæ.

There are two or three modes of finding the urethra in catheterism, without exposing the patient—a matter which, of course, should always be avoided, if possible. The woman may be placed on her back or on the left side, and the attendant, having found the anterior commissure with the index finger of his left hand, should pass the finger down lightly over the clitoris to the bottom of the vestibule, when he may feel the borders of the raised meatus, and, with a cultivated sense o touch, the aperture in its centre can easily be made out The catheter should be passed over the point of the finge which may be used both as a director, and to steady the part into the canal, when it generally glides readily into t

bladder, the handle of the instrument being a little depressed while it is passing. It must be remembered that the meatus is an aperture in a mucous surface, and it may be searched for with the point of the catheter, if the canal is not readily found. Occasionally, however, the meatus is in a state of firm contraction, and must be hit exactly in order to pass the catheter. This spasmodic contraction of the meatus, and of the whole canal, is often met with in hysterical subjects. In another and better mode of performing the operation, the accoucheur first finds the cord-like urethra in the upper wall of the vagina, and in withdrawing the index finger, feels for the meatus, at the angle formed by the lower part of the vagina and the vestibule, and introduces the instrument with the other hand. In a third mode, the operator knowing the relation of the meatus to the pubic arch, and possessing tact and experience, goes to it at once, the patient being on her
left side, with the knees raised. In this way only one han
need be used. It scarcely need be said that the latter is th
most perfect method of operating, and one which all shou
aim at being able to perform.

Various circumstances alter the anatomical relations of
meatus and urethra. The meatus may be so flaccid an
laxed that it is found with difficulty, or, after painfu
lingering labours, the external parts may become so s
from inflammation, and the effects of pressure, as to re
no easy matter to find the urethra by the touch alo
prolapsus occurring during pregnancy, the directio
meatus becomes altered so as to point towards the s
coccyx. In retroversion the meatus is drawn upw
the direction of the upper part of the canal is turn
wards and downwards, while in anteversion of t
uterus the urethra is dragged upwards; but the
of the canal is turned more forwards than usual.
impregnated state the urethra may be displac
tumours, fibrous tumours of the uterus, and by t
rations of position to which the uterus is liabl
one of the mucous lacunæ, close to the meatus
larged as to admit a small-sized catheter, and t
suppose he has reached the bladder, while the ins
in a cul de sac. The length of the urethra a
of this mistake should always therefore b
An inexperienced hand may pass the in
upper floor of the vagina, but the resist

the urethra, or a slight clasping of the instrument by the canal, will generally assure the operator that he is in the right passage.

The instruments used are, a common number 8 or 10 male catheter, with or without a stilette; a gum-elastic catheter very similar to the male catheter, except that it is somewhat shorter; and a flattened silver catheter. The stop of the silver catheter is perfect, and the urine can be drawn off by it without wetting the patient; but during labour, when this is not of so much consequence, a gum-elastic catheter is to be preferred, and if used without a stilette, it is scarcely possible for any accident to occur. It should be seen that the apertures of the catheter are free, and the point of the instrument should be dipped in oil or glycerine. The catheter should be held gently in the fingers, being lightly poised rather than grasped, and no force should be used, as both bladder and meatus have been perforated accidentally. It should be borne in mind that in case of difficulty it is far better to expose the patient than to use force, or incur the risk of injury.

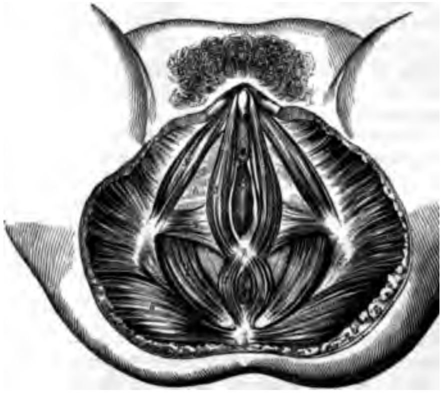
Immediately below the orifice of the meatus is the Ostium Vaginæ, slightly oval in form, and of variable diameter, according to age, childbearing, &c. In the virgin this opening is partly closed by a membranous fold, constituting the Hymen, which is commonly crescentic in form, the concave free border being turned upwards. Sometimes the hymen is deficient or wanting altogether, either congenitally or as the result of accident, so that its absence is no absolute proof of intercourse. In other cases it is circular in shape, or possesses several cribriform openings, or it may be thickened and imperforate. During intercourse this membrane is generally ruptured; but cases occur in which it is so strong and resisting, that surgical interference in the shape of a crucial incision is required. In some women, on the other hand, it is so distensible, that it readily yields, instead of tearing, and remains unbroken, even after perfect and habitual intercourse. This may account for the circumstance mentioned by Parent Duchatelet, that in some prostitutes the vagina resembles the virgin state. Rupture of the hymen is by no means necessary to conception, as impregnation sometimes occurs through the cribriform hymen, or when only a very small aperture exists. Usually, after intercourse the place of the hymen is occupied by several fleshy eminences, termed the Carunculæ Myrtiformes, which some anatomists believe to be formed by the cicatrization of the ruptured hymen, while others, as M. Rigaud, believe them to consist of reduplications of the mucous membrane, which exist before the loss of the hymen. There is a considerable amount of contractile tissue in the situation of the carunculæ, and in some cases the irritation and spasmodic painful contraction at this point is so great as to render intercourse difficult or impossible long after mar riage.

Externally to the carunculæ, on each side, and on the su face of the nymphæ, are two small openings, admitting t point of an Anel's probe, which are the ducts of the Vul Vaginal Glands. These glands, which were known to Bar line and Duvernay, and called after their names, have rec been described with great accuracy and minuteness b Huguier. They are seated on each side of the vulva, o and below the bulbi vestibuli, and in shape and size hav compared to apricot stones; their ducts are about half long. The vulvo-vaginal glands secrete a clear alb mucus, of a penetrating odour, during intercours Huguier and Scanzoni believe can be ejaculated b voluntary contractions of the neighbouring muscle glands are considered the analogues of Cowper's gla male. M. Huguier points out that they may be abscess from inflammation, or of encysted tumour, ration of their ducts.

The Perinæum is the space between the po missure and the margin of the anus. To the ob anatomy of this part is matter of great intere must be confessed, that the anatomy of the male been cultivated somewhat to the neglect of tha In the ordinary state, it is from an inch to an in length, but during labour it elongates t times this size. At the fourchette, the per ratively thin, but towards the anus it is of c ness. It is composed chiefly of skin, cellula fibres, and the mucous membrane of the certain peculiarities in the arrangements of perinæum which deserve notice. They a least one extremity into tendinous st This occurs in the case of the sphinct coccygei, transversales perinæi, erec sphincter vaginæ. The fibres of man indistinct as compared with other mu

with a considerable quantity of elastic dartoid tissue.
circumstances greatly facilitate the dilatation of the p
at the time of labour. It must be borne in mind, t
perinæum has a two-fold function; one to dilate du
passage of the child; the other, to support the pelvic
under other conditions. When its structures are ri
undilatable, we have the danger of laceration; and w
dilatability is excessive, the patient is liable to prola
other displacements of the uterus and vagina. A
arrangement with regard to their insertion, holds goo
case of the abdominal muscles, and facilitates their di
by the gravid uterus during pregnancy. (Fig. 10.)

FIG. 10.



1. Sphincter ani. 2. Tendinous point of perinæum. 3. Sphi
vaginæ. 4. Transversus perinæi. 5. Erector clitoridis. 6. Ap
rosis. 7. Levator ani. 8. Gluteus maximus.

The Vagina extends between the internal and extern
of generation; but, as it is concerned with the l
coïtus, and bears no share in the development of the
may be conveniently described with the external
This canal is slightly curved, the concave surface b
wards and forwards, and its direction is nearly that
outlet, and lower portion of the middle, of the pelvi

e vagina is about four inches long, the pos-
or six inches in length. This is partly on
greater length of the lower curve, and partly
way in which the uterus is inserted into the
axis of the uterus is nearly the same as the
et of the pelvis, so that the uterus is inserted,
nto the anterior wall of the vagina, while the
l is prolonged behind the os uteri. This canal
virgins than in women who have borne children,
multipara. It is also longer in the middle months
cy than in the beginning, or towards the termin
station. It is elongated in some cases of fibro
tumour, when the tumour is supported above
the pelvis, and raises the uterus with it. The
f the vagina varies in different parts of the
maller at the outlet than in the middle and up
In ordinary cases, the sides of the vagina are
and this acts as a valvular arrangement for pr
ccess of air to the uterus. As regards stru
na is composed of an external, middle, and m
ssue. The external layer consists of cellular t
nects it anteriorly with the bladder and ureth
h the levatores ani, and posteriorly with the
e peritoneum. The connexion with the perit
e upper and posterior fourth of the vagina, wh
oneal cavity dips down between the vagina and
The middle coat is dense and fibro-cellular, an
structure to the proper uterine tissue, with w
nuous at the os and cervix uteri. It has be
Cruveilhier and other anatomists to the darto
nancy, it partakes of the growth of the
tissue, though in a less degree. The mu
vagina has upon the mesial line of its ant
surfaces two ridges, termed the column
these two columns, folds of mucous m
nearly right angles, the folds being mo
lower part of the passage. The rugæ of
distinct in virgins, less so in women accus
and they nearly or altogether disappear
borne children. The vagina also beco
ho have never borne children as age
are to yield an extensi
distension of

Examined microscopically, the vaginal mucous surface is found to be studded with vascular papillæ, which have been described and figured by Dr. Franz Kilian, and which are probably the seat of the great sensibility of the organ. The whole surface is covered by a thick layer of tesselated or squamous epithelium. Writers on the subject generally describe the vagina as containing great numbers of mucous follicles, which are supposed to secrete the mucus which lubricates the vagina at ordinary times, and especially at the time of parturition. In my own examinations, I failed to find any large number of glands, except at the outlet of the vagina; and with this exception, the mucus of the vagina is, I believe, produced by the epithelium, and consists of plasma and epithelial particles. The secretion of the vagina, as pointed out by M. Donné, and Dr. Whitehead, of Manchester, is distinctly acid. The acid secretion is believed to be serviceable in preserving the fluidity of the sanguineous menstrual secretion, and thus of facilitating its escape from the vagina. It has also an antiseptic effect, and tends to prevent the decomposition of coagula. It likewise contributes, with the rugæ of the vagina, to stimulate the penis during coïtus. Beside the coats of the vagina already described, it is surrounded, particularly near the outlet of the passage, with a plexus of veins, resembling erectile tissue; and it possesses a muscle, the sphincter vaginæ, arising from the tendinous point of the perinæum, inclosing the bulbi vestibuli, and inserted into the clitoris. A fasciculus of the muscle crosses the vena dorsalis, and aids in promoting the turgescence of the clitoris. The arteries of the vagina are branches of the internal iliac, and the veins empty themselves into the internal vein. It derives its nerves from the hypogastric plexus, and from the third and fourth sacral nerves.

The vagina resembles skin quite as much as mucous membrane, and in cases of procidentia, where it is exposed, it becomes converted into dermoid tissue. The chief functions of the vagina are as an organ of sensation and introception, and as a canal for the passage of the fœtus and the catamenial secretion. It also undoubtedly possesses some contractile power, both voluntary and reflex. This is seen in the expulsion of coagula during menstruation, and after parturition, and in its contraction on the introduction of the speculum. The vagina likewise contracts with considerable force *during* the passage of the child, and it sometimes expels the placenta after labour, when it has been forced into the passage by the uterus.

It may be necessary to say a word respecting the physiology of Coïtus, as regards the female. The sexual orgasm of the male is well recognised. We know that it begins with excitement of the glans penis, and ends in spasmodic contraction of the vesiculæ seminales and ejaculatores muscles, this contraction being attended by the sensorial orgasm. The female is considered "passive," both by Prof. Müller and Dr. Carpenter, during coïtus, but this is evidently a mistake. The sexual "paroxysm" in the female was fully recognised by John Hunter, and is as distinct as that of the male. It begins in the clitoris, and ends in an orgasm or paroxysm of sensation. Whether the sensation excites any spasmodic reflex action may be a question. Is the ejaculation of the secretion of the vulvo-vaginal glands described by M. Huguier, the analogue of emission in the male? Whytt and the older anatomists believed in the contractions of Fallopian tubes during intercourse. These points may be considered as yet unsettled, but of the existence of the sensorial orgasm there can be no doubt, and its absence constitutes impoter in the female. It should be observed, however, that orgasm is not at all necessary to conception. Wome whom Heberden applied the term "frigida" conceive as as those who are perfect in this respect. Impregnation sists in the meeting of the spermatozoa and the ovul can never take place at the moment of coïtus. The ur the male and female elements of reproduction in th or Fallopian tubes is no more attended by sensatior the conjugation of the Gregarinæ.

An account of the external organs of generation be complete without a description of the Mammæ, f the infant derives its nourishment for some time The mammary glands are placed upon the pec muscle on each side, extending from the third to rib. This situation, which is in great measure p human female,—the mammæ being, in the vas animals, placed upon the abdomen,—is evident the nursing of the infant while supported in th mother. These glands are hemispherical in sh nal aspect being convex, the posterior flat or The left breast is generally the larger of th ed in nursing. Each gland is envelop

dartoid ca
tions of
tity of ad
The i
lobes, w
we ar
the g
with
pli
wh
m

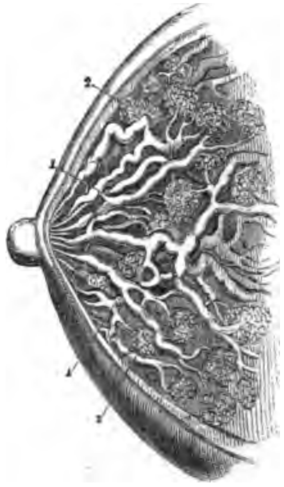
dartoid capsule, which dips down between the various portions of the gland, and is surrounded by a considerable quantity of adipose tissue.

The intimate structure of each gland consists of numerous lobes, which are divisible into smaller and smaller lobuli, until we arrive at the ultimate follicles of which the substance of the gland is composed. The follicles and ducts are covered with a layer of epithelium. It is by the growth and multiplication of the nuclei, and the bursting of the epithelial cells, which have been found by Prof. Goodsir to be filled with milky fluid, that the lacteal secretion is produced. These follicles or vesicles, having cæcal extremities, empty themselves into small tubes, which unite with each other, and proceed in a tortuous course towards the centre of the gland, becoming larger and larger, and terminating in from ten to fifteen galactophorous tubes, which are collected together, but without much inosculation, near the base of the nipple. As they approach the nipple, they dilate, to form sinuses or ampullæ, which act as reservoirs for the milk. Underneath the nipple they contract again, and pass by separate ducts to the surface of the mamilla, where their openings are found in depressions of the mucous membrane. The lactiferous tubes are wanting in valves, but are closed at their external apertures by sphincter-like fibres.

The surface of the gland is covered by delicate integument, and at its summit is placed the nipple, which, in the virgin, or in women who have not borne children, is conoidal in shape, but in nursing women assumes a flattened or cribriform appearance at its extremity. The site of the nipple is on a level with the fourth rib. This, the most vascular part of the breast, contains a certain quantity of erectile tissue, which makes the nipple turgid, and tends to dilate the openings of the milk-ducts, under irritation. The turgescence is generally accompanied by pleasurable sensations, the surface of the nipple being covered by numerous nervous papillæ. The sensation of "the draught," which is excited by emotional causes, the suckling of the child, or, as a reflex action, by the ingestion of blood or drink into the stomach, is felt in the nipple, and is followed by a rapid secretion of milk. The nipple contains a considerable quantity of dartoid contractile tissue, which is probably concerned in the closure and dilatation of the milk-ducts. The action of this tissue and the capsule *covering the* gland, contributes to the expulsion of the milk.

The base of the nipple is surrounded by an areola, of a pinkish hue in the virgin, but in the pregnant woman pigment cells are deposited in it, and the areola becomes darker in colour. On the surface of the areola are numerous small tubercles, or sebaceous glands, which secrete a fatty matter, intended to defend the nipple during lactation. Sudoriferous glands are also found upon the areola.

FIG. 11.



1. Galactophorous ducts. 2. Lobuli of the mammary gland.

The mammary glands receive their supply of blood from the thoracic intercostal, internal mammary, and epigastric arteries. The veins are those accompanying these arteries. Around the nipple, the veins are arranged in a circular manner, the circulus venosus of Haller. During pregnancy, as Mr. Nunn has pointed out, owing to the interference with the internal circulation by the pressure of the gravid uterus, the circulation through the internal mammary and epigastric arteries, and the veins of the surface of the abdomen and thorax, is very much increased—a mechanical condition which probably contributes to the development and supply of blood to the mammary glands during gestation. The nerves are chiefly branches of the intercostals. The lymphatics are very numerous, and maintain connexions with the lymphatics of the axilla, anterior and posterior mediastinæ, and other parts. These lymphatics are believed to absorb the watery portions of the milk when first secreted, and it is to these vessels that we address ourselves when we endeavour to diminish the quantity of the milk by frictions. (Fig. 11.)

CHAPTER III.

THE INTERNAL ORGANS OF GENERATION.

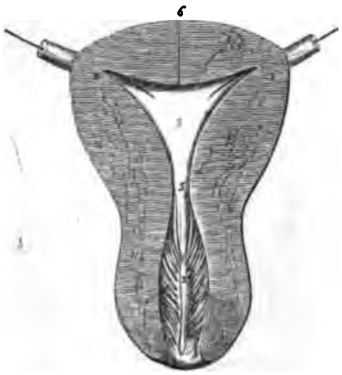
The Uterus is, in an obstetrical sense, by far the most important of all the organs of generation. It is in this viscus that the ovum is received, retained, and nourished until the fœtus becomes fitted for extra-uterine existence, and to the physiological action of this organ, its expulsion at the end of utero-gestation is mainly due. The following description will have reference chiefly to the unimpregnated uterus.

In shape the Virgin or Nulliparous uterus is pyriform. Dubois describes it as a cone compressed from before backwards, and compares it to a flattened calabash, the base of which is directed upwards, and the orifice downwards. The uterus is placed in the middle of the upper part of the pelvis, its direction being the same as that of the pelvic inlet. It is situated above the vagina, and below the ilium, having the bladder in front, and the rectum behind it. Thus the inferior part of the uterus has a vaginal, and the upper part a peritoneal aspect. The lower part of the organ consists of the Os uteri, possessing an anterior and posterior lip, and constituting the outlet of the uterus as regards the catamenial secretion, and the products of impregnation; and its inlet, with respect to coïtus, and the fertilization of the ovum. Above the os uteri is situated the Cervix, and the highest part of the uterus is called the Fundus, the upper and middle portion being termed the Body. The cervix and body contain a canal and cavity, but the great bulk of the organ consists of its walls, which are of considerable thickness. The external surface of the uterus is in part covered by mucous membrane, and in part by peritoneum, the rest of its superficies being occupied by attachments to other organs. The uterus is from two and a half to two and three-quarters of an inch in length, its breadth being, from one Fallopian tube to another, about an inch and a half, or an inch and three-quarters. At the cervix the breadth of the uterus is about an inch. From before backwards its greatest diameter is about an inch, and the greatest thickness of its parietes, which is in the middle of the body, is about half an inch. The anterior surface of the uterus is somewhat flattened, the posterior being convex.

The os uteri is circular or somewhat oval in form, its transverse diameter being generally greater than the antero-posterior. Of the two lips of which it is composed, the anterior is the lower, so that it somewhat hides the posterior lip, as well as the orifice. The fissure itself is, in the nulliparous uterus, not circular, but transverse, the external angles of the rima being directed backwards, like the mouth of a fish. It is from this peculiarity that it derives its name of os tincæ.

The canal of the cervix is fusiform in shape. There is a slight constriction at the os uteri, and a more considerable narrowing of the canal at the os uteri internum, or the point at which the canal of the cervix enters the cavity of the body. The cervical canal is flattened from before backwards, and is about an inch and a half in length. It is lined by mucous membrane, which is arranged in a peculiar manner. When the cavity of a virgin cervix uteri is laid open, the internal surface is generally found to contain four columns of rugæ, arranged more or less in a transverse direction. The reduplications of the cervical mucous membrane may be compared to an open book, and the names, penniform rugæ, palmæ plicatæ, and arbor vitæ internus have been applied to them.

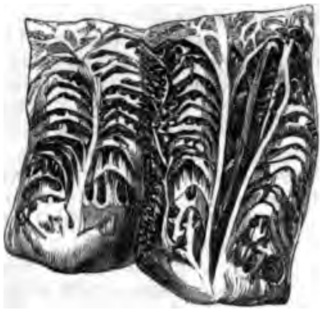
FIG. 12.



1. Cavity of the body. 2. Canal of cervix. 3. Opening of Fallopian tubes. 4. Penniform rugæ. 5. Os uteri internum. 6. Fundus.

These rugæ are separated by four grooves or sulci, two of which divide the anterior from the posterior walls; the other two, which are the most marked, being upon the median line in the anterior and posterior walls. There are from ten to fifteen rugæ in each column. These rugæ, and the spaces between them, are everywhere covered by such multitudes of mucous cysts or follicles, that on a moderate computation, under a power of eighteen diameters, at least ten thousand mucous follicles are visible in a well-developed nulliparous organ. The cervix uteri may in effect be considered as an open gland. The rugæ are evidently a provision for the dilatation of the mucous membrane in the latter months of pregnancy, and during parturition. They also provide an extensive secretory surface. (Fig. 13.) The objects of the secretion are to keep the cervix uteri impermeable to air, to provide a fit medium for the ascent of the spermatozoa, to furnish the plug which fills the cervix during pregnancy, and to secrete the mucus which lubricates the os uteri and vagina during labour. The secretion consists of mucous corpuscles and plasma, having a distinct alkaline reaction, while the secretion of the external portion of the os is decidedly acid. The limits of the acid and alkaline secretion are determined by the presence of squamous or cylindrical epithelium. Where the epithelium is cylindrical, the secretion is alkaline; where there is squamous epithelium, the mucous secretion becomes acid.

FIG. 13.



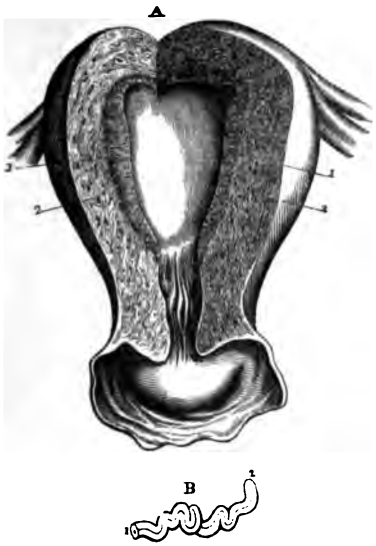
View of the canal of the cervix uteri laid open.

The cavity of the body of the nulliparous uterus is triangular in shape, the base of the triangle being above, and the apex below. At the two superior angles, the Fallopian tubes enter the uterus, while at the inferior angle the canal of the cervix communicates with the body of the organ. The angles leading to the Fallopian tubes are grooved; and at the middle of the triangular space, the anterior and posterior walls of the body of the uterus project internally. The thinnest part of the walls of the uterus is at the entrance of the Fallopian tubes; the thickest is at the middle part of the fundus, and the parietes of the body opposite the middle of its triangular cavity.

Perhaps the most remarkable structure of the uterus, or, indeed, of the whole body, is the mucous membrane which lines the cavity of its body. It is, in the healthy condition, pale in colour, about a line in depth, and forms a thin layer, one aspect of which is free, the other being closely united to the proper tissue of the walls of the uterus. If the surface of the unimpregnated womb be examined with a lens, numerous points are visible, which are openings of the glands of the mucous membrane. The openings are given by Kölliker as one-thirtieth of a line in diameter. These glands are tubular, and slightly coiled upon themselves, closely resembling the glands of Lieberkuhn in the intestine. Their general arrangement, and that of the connective tissue around them, is concentric, the open mouth of each gland being upon the surface of the mucous membrane, and its cæcal portion deeply seated in the attached surface. Sometimes the utricular glands are double, or two glands may open upon the mucous surface by the same outlet. These glands are supposed by some to secrete mucus. Dr. West, for instance, supports the view that in leucorrhœa much of the discharge is, in certain cases, derived from these glands. Some believe they secrete the menstrual fluid. Others affirm that they elaborate the material out of which the decidua reflexa is formed. The latter, which is the opinion of Prof. Goodsir, Dr. Sharpey, and Kölliker, is probably the correct one. (Fig. 14.)

The mucous surface of the uterus, as already mentioned, is covered by epithelium. In the cavity of the body this is cylindrical and ciliated. The cilia vibrate from below upwards, and probably assist the ascent of the spermatozoa. In the cervix, the cilia are not always present, and at the margin of the os, at the lowest part of the canal of the cervix, the cylindrical epithelium ceases, the whole of the vaginal aspect of the os and cervix being covered by squamous epithelium, similar

Fig. 14.



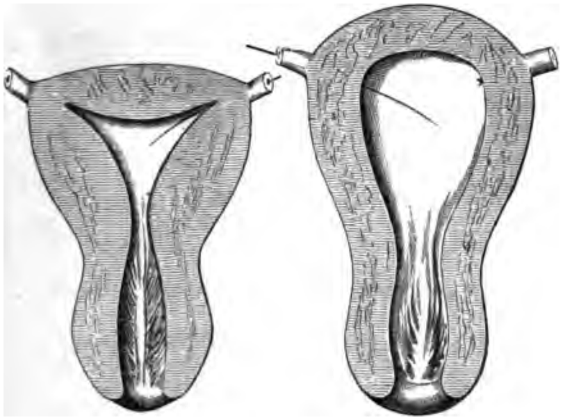
A. Uterus laid open. 1. Mucous membrane of uterus. 2. Substance of the uterine walls.
B. A single gland from the mucous membrane of the uterus. 1. Mouth of the gland. 2. Cæcal extremity.

to that of the vagina. Underneath the epithelium, club-shaped papillæ or villi are everywhere found. Each villus consists of one or two looped bloodvessels and a cellular envelope, the whole being covered by epithelium. These villi are larger within the os uteri than upon its external surface, but they are less numerous in the upper part of the cervical canal, and the cavity of the body. At the os uteri these papillæ appear to possess special sensation of a sexual character. It is also probable that they play a part as excitors of reflex and peristaltic action.

According to the recent researches of Kölliker, Kilian, Mr. Rainey, and others, the substance of the uterus is made up of connective tissue and a vast number of fusiform fibre cells, fibre germs, or embryonic nucleated cells, having the power of development into non-striated involuntary muscular fibres. The diameter of these cells is about $\frac{1}{4000}$th of an inch, and their length is somewhat greater, so that they are slightly elongated in shape. In the unimpregnated uterus, under ordinary circumstances, the fibre cells or germs remain quiescent, and are not the subject of any increase in size. On the occurrence of impregnation, the growth of a polypus in the uterus, or any continued irritation of the cavity or walls, the embryonic fibre cells commence a career of growth and multiplication. These fibre cells are of great importance, as it is entirely to their development that the gravid uterus owes its contractile properties. They may be compared to the derivative germ cells by which lost parts are reproduced in the lower animals, and which, but for the loss which calls forth their development, would for ever remain inactive. In the case of the uterus, unless impregnation or some other stimulus be applied, these germ fibres remain through life in a rudimentary state. In the unimpregnated condition, it is probable that the germ fibres or fibre cells are in a more advanced state in some uteri than others, particularly in multipara. Cases are met with in which the uterus expels coagula, or the dysmenorrhœa membrane, by contractile efforts, even in the unimpregnated condition. It is probable, indeed certain, that, by relaxation of the fibre cells of the os and cervix, and contraction of those of the body, the os uteri may be opened and matters frequently expelled from the cavity of the virgin uterus.

The differences between the virgin or Nulliparous uterus, and the Multiparous organ, have been very strongly insisted upon by M. Paul Dubois. The term nulliparous uterus is evidently to be preferred to that of virgin uterus, as intercourse without impregnation exerts no influence upon the anatomical characters of the organ. In the multiparous uterus the anterior and posterior surface of the body is more rounded. The fundus, instead of being flat, is convex, so that there is a considerable protuberance above a line drawn from tube to tube. The vaginal portion of the neck is altered, being more conical and elongated. The os uteri, instead of presenting a transverse fissure, is rounded or puckered in shape. The depression felt by the finger is more evident, and the orifice is considerably larger. These changes in the os uteri are most evident in women who have borne large families. They are imitated to a slight extent in nulliparous women who have been subject to inflammatory conditions of the os uteri, dysmenorrhœa, polypus, or any of the conditions which excite the growth of the organ. The uterus which has been fully developed by gestation never returns, unless as a morbid condition, to the size of the nulliparous organ. Meckel gave the weight of the nulliparous organ at seven or eight drachms, and the multiparous at an ounce and a half. The diameters are all increased in the multiparous organ. (Fig. 15.) The interior of the uterus also offers some remarkable differences in the two organs. The cavity of the body of the multiparous womb is considerably enlarged. The os uteri internum is less distinct, and the canal of the cervix is shorter, the penniform rugæ being to some extent obliterated. The cavity of the body, instead of being distinctly triangular, is oval in shape, the angles into which the Fallopian tubes enter having entirely disappeared. (Fig. 16.) These changes are not without practical importance. Their consequence is obvious in a medico-legal point of view. A few years ago a lady of family

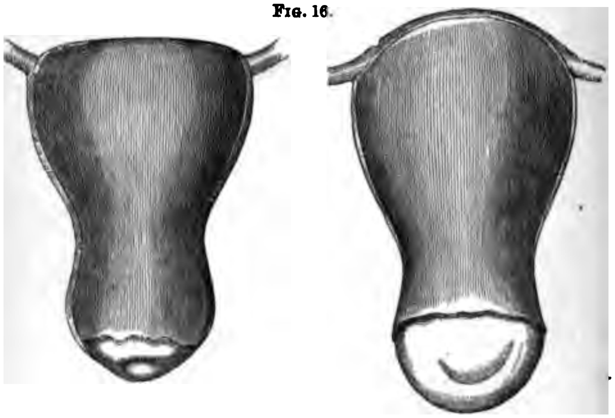
FIG. 15.



Sections of the nulliparous and multiparous uterus.

and her maid were burnt to death together in an hotel at the West-end. The bodies were so mutilated as to render any recognition by external signs impossible; but the lady had borne a numerous family, and the identity of her body was ascertained from the condition of the uterus. Again, in the return of the uterus to the unimpregnated state after parturition, the involution of the organ may be so excessive as to produce amenorrhœa and sterility, or, which is more frequent, it may be incomplete, and give rise to menorrhagia.

FIG. 16.



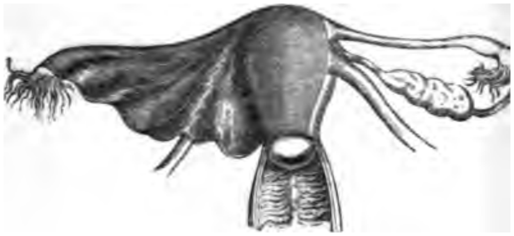
External views of the nulliparous and multiparous uterus.

The uterus is supplied with blood by four arteries, the two ovarian, or spermatic, and the two uterine. The upper part of the organ is supplied by the ovarian, and the lower by the proper uterine vessels. In the substance of the uterus they run a very tortuous course, anastomosing very frequently. The veins correspond to the arteries. Their walls are very thin in the uterus, and they possess no valves. They communicate with the veins of the bladder and vagina, and empty themselves into the iliac and ovarian veins. The lymphatics are numerous, but of small size before impregnation, and chiefly enter the lumbar glands. The uterus is principally supplied with nerves by the hypogastric and sacral nerves, and by branches from the ovarian plexus; but I propose to enter into the question of the nervous supply of the uterus when treating of the increase of the various tissues of the gravid uterus, and of the motor endowments of the parturient organ.

The Fallopian tubes extend on each side from the upper angles of the uterus towards the brim of the pelvis. Each tube is from four to five inches in length. The first direction is upwards and outwards; it then passes downwards, backwards, and inwards. The tubes can be felt as cord-like structures in the broad ligament, the uterine half being thicker than the external or ovarian portions. They are pervious throughout, the diameter of the canal being smallest at the uterine extremity. At the entrance to the uterus it, however, readily admits a fine whalebone stilette. At the distal extremity, or ostium abdominale, each tube terminates in the corpus fimbriatum—a fringe-like structure, which may be compared to the tentacles of a polyp. In the centre of the circular fringe is seated the ovarian aperture of the tube, considerably larger in size than the ostium uterinum. One of the fringes, or a separate ligamentous band, generally connects the Fallopian tube with the ovary, but the aperture and the general mass of the corpus fimbriatum floats loosely in the neighbourhood of the ovary. The internal surface of the tubes is lined by a mucous membrane, continuous with the mucous membrane of the uterus. It is thrown into longitudinal folds, so as to admit of dilatation, and is covered by ciliated cylindrical epithelium, the movements of the cilia being from the ovarian towards the uterine extremity. The mucous membrane of the tubes is thin, and devoid of villi or glands. The middle coat of the Fallopian tubes is continuous with the middle coat of the uterus, the fibres being more developed, and arranged as an external and longitudinal, and internal and circular layer, fitted for the vermicular or peristaltic movements which the tubes are called upon to perform. These layers are intermixed with connective tissue, similar to that found in the stroma of the ovary and the middle walls of the uterus. The external surface of the tubes consists of the peritoneal folds, constituting the ligamenta lata. (Fig. 17.)

As regards the function of the tubes, the ciliary currents and the muscular contractions combine to convey the i nated or unimpregnated ovum from the ovarium to the cavity. The tubes are really to be considered as the o of the female economy. When they fail of their office impregnated condition, we have extra-uterine gestation

FIG. 17.

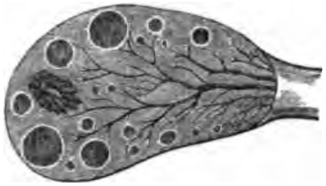


Relations of the unimpregnated uterus, vagina, ovaria, Fallopian tu round ligaments.

result. There is scarcely anything more mysterious range of physiology than the grasping of the ovary fimbriated extremity of the tube when there is an impre ovum to be conveyed to the uterine cavity. At the time pregnation there is not merely a grasping of the ovary, b tube must be applied to precisely the spot upon the ov from which the ovulum is about to emerge. How is t lection to be accounted for? It is evidently one of those actions in which the excitor and reflex stimuli are in such and exquisite relation as to simulate the most perfect of volition. Perhaps it is not more wonderful than wh curs in the case of the polyp. When a particle of f placed on any part of the surface, the filaments of th fringes turn with precision to the foreign matter, and g for conveyance to the interior of the animal. It appears as though the different parts of the ovary were in ex lation with the corpus fimbriatum, or that when the o stimulus has excited the fringes to contractions upo ovarian surface, only that part of the ovary is firmly g which is in a state of irritation, such as that which a the maturation or escape of an ovulum. During menstru the Fallopian tubes have been found firmly grasping the ovaria by Gendrin and other observers. The embrace of the ovaria is favoured by the turgescence and rigidity which the tubes assume under excitement, as observed by Cruikshank, and which directs them towards the ovaria.

The Ovaria are the analogues of the testes in the male, and constitute the dominant or prerogative organs of the female generative system. They are two flattened bodies, somewhat oval in form, or tending to a crescentic shape. Their length is considerably greater than their breadth, but the upper surface is slightly convex, and the lower somewhat concave. They are situated in the posterior fold of the broad ligament, and behind the Fallopian tubes. The ovaria are about half an inch thick, three-quarters of an inch wide, and from an inch to an inch and a half long. They are connected, as already mentioned, to the corpora fimbriata, and a ligament attaches them to the uterus, near the insertion of the Fallopian tube. This ligament, the Ligamentum Ovarii, connects the stroma or parenchyma of the ovarium, with the proper tissue of the uterus. These organs are entirely covered by peritoneum, except at the hilus, where the nerves and vessels enter, but are directly enveloped by a white fibrous tunic, the tunica albuginea, analogous to the membrane of the same name in the testis. The tunica albuginea encloses the proper structure, or stroma, of the ovary, which is reddish-white in colour, and similar in constitution to the proper fibrous structure of the uterus. Scattered about in the stroma of the ovary, but particularly towards the external surface, numerous small vesicles are found, varying in size from a pin's head to a small pea. These are the Graafian vesicles, or mucous follicles, as they should more properly be called. There are generally from ten to twenty, or more, in, or near, a state of maturity; but a far greater number of small vesicles are visible by the aid of the microscope, and are constantly maturing to replace those lost by the periodical rupture of the most advanced follicles. (Fig. 17.) The ovaria must be considered as two Follicular Glands. Each Graafian follicle represents the ultimate tubule, or follicle, of a secreting gland, lined with mucous membrane, from which it differs only in being closed on all occasions, except at the time when it discharges its contents. This tendency to the formation of closed vesicles or mucous follicles, extends to other parts of the generative system. It is met with in the Fallopian tubes, in the cavity of the body and cervix, at the os uteri, as in the case of the Nabothean follicles, and even in the vagina. The minute anatomy of the Graafian follicles will be given in a subsequent chapter, in connexion with the subjects of ovulation and menstruation. The ovary is supplied with blood by the spermatic and uterine arteries, which enter at the lower border, and after numerous divisions, take a serpentine course in the stroma, and are distributed to the tunica albuginea, the stroma, and the walls of the Graafian follicles. The veins follow the same course, and empty themselves into the uterine and internal spermatic veins. The lymphatics are few in number. The nerves are fibres derived from the renal and spermatic plexuses.

FIG. 18.



Section of human ovary, showing the formation of Graafian follicles. (About twice the natural size.)

The lower part of the uterus is attached to the bladder and rectum by folds of the peritoneum, which are sometimes called the Anterior and Posterior Uterine Ligaments. The peritoneum, reflected upwards, covers the anterior and posterior surfaces of the uterus, inclosing the organ between two layers of this membrane. These layers meet together at the sides of the uterus, and pass off to the lateral walls of the pelvic cavity, dividing the pelvis transversely. In this way, the peritoneum forms the principal part of the Broad Ligaments of the uterus. The fibrous or rudimentary muscular structure of the uterus itself also extends into these ligaments. They contain besides, the Fallopian tubes, the ovaria, the Round Ligaments, together with bloodvessels, nerves, and lymphatics. The round ligaments arise from the upper angles of the uterus, in front of the Fallopian tubes. From this origin, each ligament passes to the inguinal ring, descends the inguinal canal, turning round the epigastric artery, and its fibres are inserted into, or united with, the structures of the mons veneris. The length of the round ligament is from four to five inches. The external transverse fibres of the proper substance of the uterus are prolonged into the round ligaments, of which they form a constituent part. Some fibres of the internal oblique muscles also enter the lower part of the canals, and extending upwards, contribute to the formation of the ligaments. The ovaria have already been shown to be connected with the uterus, at the point of insertion of the Fallopian tubes, by a fibro-cellular cord or ligament, prolonged from the proper substance of the uterus. Thus the fibroid embryonic muscular tissue of the uterus is continued from below into the vagina, and above into the ovaria, Fallopian tubes, and the broad and round ligaments. This arrangement probably facilitates the great displacements of the vagina, tubes, ligaments, and ovaria, which occur physiologically during the growth of the gravid uterus. The growth of the muscular tissue in these several parts allows of their elongation and change of position without injury or rupture.

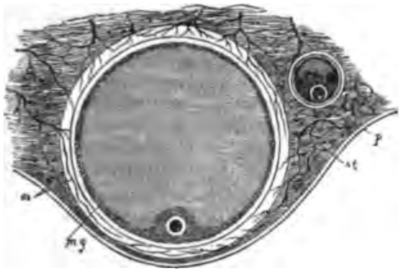
CHAPTER IV.

OVULATION.

The mature Graafian follicle is about the size of a small pea. It is formed of two layers—one internal and fibro-cellular in structure; the other external and vascular, consisting of the condensed ovarian stroma. The external surface of the ripe vesicle is also covered by the indusium of the ovary. It is the internal membrane which forms the proper ovisac. The ovisac is lined by a granular layer of epithelium. Altogether, the envelope of the follicle may be considered as a mucous membrane, and the Graafian follicles constitute the mucous follicles of the Ovarian Glands. Graafian follicles appear in the ovary at or soon after birth, being at first small, and distributed throughout its structure; but they gradually increase in size, and at puberty the largest follicles are found upon the surface of the organ. From this time to the decline of the catamenia, a succession of Graafian follicles ripen and find their way to the surface of the ovarium, when they rupture and discharge their contents, chiefly at the catamenial periods.

Each follicle contains a clear fluid, similar to the serum of the blood, in which are granular particles and nuclei derived from the epithelial lining. When De Graaf, of Delft, in Holland, described, in 1673, the follicles, which have since borne his name, they were supposed to be the actual ova of mammalia, though anatomists were at a loss to account for the small size of the impregnated ova occasionally found in the uterus and Fallopian tubes, as compared with the ovarian vesicles themselves. But in 1827, Von Baer, of St. Petersburg, discovered the true ovule within the Graafian vesicle; and since that time, the relations of the ovule to the other contents of the ovisac have been carefully examined by many distinguished anatomists. I may here mention that, in speaking of the unimpregnated state, it will be more precise to use the word Ovule, or Ovulum, reserving the term Ovum for the ovule after the occurrence of fecundation. It may also be observed that a close analogy exists between the ova of all animals, so that observations made upon one class of animals have a general application, and the history of the human ovule has been made out partly by the study of the ovule in the human female, and partly by the light thrown on the subject by researches in comparative anatomy. At first, and while the Graafian follicle is imbedded in the ovary, the ovule is found in the centre of the vesicle. At this time, the semi-transparent and albuminous matter and granules contained in the follicle have the following arrangement:—The granules are accumulated in the form of a layer on the internal surface of the ovisac, so as in a great degree to resemble an epithelial lining. This layer has been termed the Membrana granulosa. Immediately surrounding the ovule, another granular layer is found, which has been called the Tunica Granulosa. Passing between these two layers are certain granular bands, constituting what are termed the Retinacula, which retain the ovum in its place. When the follicles mature and approach the ovarian surface, the ovules also rise towards the free surface of the follicles, as Dr. Martin Barry believed, by the contractions of those bands of the retinacula situated on the superficial aspect of the vesicle; while the membrana granulosa and tunica granulosa now become fused together in those portions near the surface of the ovisac. The ovule thus becomes imbedded in an aggregation of granules, which is named the Cumulus Proligerus, or proligerous disc. If each Graafian follicle were spread out, we might consider each particular ovule as lying upon the surface of a mucous membrane, and enveloped in an accumulation of granular or epithelial matter. (Fig. 19.)

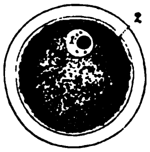
FIG. 19.



Section of two Graafian follicles, of different sizes. *p.* Peritonea covering. *s. t.* Ovarian stroma. *o. r.* The two layers of the ovisac. *m. g.* Membrana granulosa, or epithelial lining of the ovisac. Around the ovum this membrane is seen forming the proligerous disc. (Enlarged about eight diameters.)

Passing to the description of the ovule itself, it is found to measure about $\frac{1}{200}$th of an inch in diameter, and to consist of an external membrane, Zona Pellucida, or vitellary membrane, a vitellus or yolk, and a Cell, which is termed the Germinal Vesicle or Germ Cell. (Fig. 20.)

FIG. 20.



Human ovule. 1. Germinal vesicle. 2. Yolk.

The vitellary membrane is the containing membrane of the yolk, and the yolk itself differs considerably in different classes of animals. The yolk of the mammiferous ovule is very small, as compared with the yolk of birds and amphibia. In the mammalia, the yolk consists of elementary granules, all or nearly all of which are exhausted in the early germinal processes of the ovum after impregnation has taken place; while in the ovipara, the yolk is composed of two kinds of material, the one consisting of granular particles, similar to those of the mammalian ovule, and termed the Germ Yolk; the other and larger portion, of fat globules, intended for the nutrition of the ovum during incubation or early development, and termed, in contradistinction to the former, the Food Yolk.

As regards size and position, the Germinal Vesicle bears much the same relation to the ovule, as the ovule does to the Graafian follicle. The germinal vesicle was first discovered in the ovule of the bird by Purkinje, of Breslau, in 1825, and when the mammalian ovule became known, the vesicle of Purkinje was soon sought for, and found by M. Coste. In man and mammalia, the germinal vesicle is about the one-sixtieth of a line in diameter.

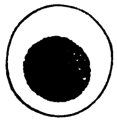
Within the germinal vesicle or germ cell itself, is contained another important element of the reproductive process. In 1835, Rudolph Wagner, of Göttingen, and Mr. Wharton Jones in this country, discovered contemporaneously, a nucleus or collection of fine granules in the interior of the germinal vesicle, which has been called the Macula Germinativa, or germinal spot. In some animals the macula is nuclear in character, while in others the germinal spot consists of a mass of small granules. This addition to our knowledge of the ovule brought this germinal vesicle within the category of ordinary nucleated cells.

The Macula Germinativa is the nucleus or centre of the whole of this wonderful organism, and it may be useful to trace the anatomy of the mature Graafian follicle from within outwards. Surrounding the germinal spot, we have the germinal vesicle. On the outside of the germinal vesicle, there is the yolk, enclosed in the vitellary membrane. These structures, taken collectively, constitute the ovule. The ovule itself is contained within the Graafian follicle, but it does not remain in its centre, this being occupied by the liquor folliculi. The ovule is seated in a cumulus, or mamelon of granular epithelial matter, constituting the proligerous disc, and forming part of the lining membrane of the follicle. On the outside of this membrane there are the fibro-cellular and vascular layers of the follicle; and lastly, upon its free surface, the indusium, or ovarian portion of the peritoneum. (Fig. 21.)

As the ovule is not at the surface of the Graafian follicle, so the germinal vesicle is near the superficial surface of the ovule, and the macula germinativa is near the cell in all of the germinal vesicles. Thus the germinal spot, altogether covered by the indusium, the membranes of the follicle, the zona pellucida, and cell-wall of the germinal vesicle, is in reality very near the external surface of the Graafian follicle.

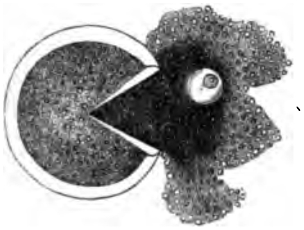
When the Graafian follicle is ready to shed the ovule, it protrudes slightly above the surface of the ovary, and the rupture of the follicle is apparently caused by an increase of the liquor folliculi, or fluid secreted by the epithelial lining of the ovisac. The gradual distension of the follicle causes a thinning of its fibrous and vascular walls, and of the indusium, until at length it bursts. The ovulum has at this time approached the apex of the projecting part of the follicle, and is discharged with the liquor folliculi, surrounded by the granular matter constituting the proligerous disc. (Fig. 22.) If the tube is applied to the ovary, the ovulum at once passes into the oviduct. At this step of the process, we may recognise the glandular structure and function of the ovary. When the peritoneum and membranes of the ovisac are perforated, and the sugescent embrace of the ovarium by the Fallopian tube occurs, the channel from the uterus to the ovary is quite as unbroken as that from the bladder to the kidney. The ovisac is now the cæcal extremity of a glandular follicle, and the Fallopian tube is its excretory duct.

Fig. 21.



Germinal vesicle and macula germinativa.

Fig. 22.



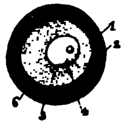
Ruptured Graafian follicle, with the escape of the ovule.

At this point, the question occurs as to the mode in which the ovule is formed in the Graafian follicle. The earliest condition in which the follicles are seen in the embryo is in the shape of a spherical mass of cells, containing the germinal vesicle in its centre. From the external cellular mass is developed the membranes of the follicles, its epithelial lining, and the vitellary membrane. It is a question whether the germinal vesicle is formed or secreted by the cells forming the follicle, or whether its nucleus exists at the time the spherical

arrangement of the cells takes place, the follicle being de
loped around the germinal vesicle and its nucleus. S
believe, with Huschke, that the ova are formed of acini,
tached from the substance of the stroma of the ovary; ot
hold, with Dr. Martin Barry, that they are formed from
nuclei found in great numbers in the ovarian parenchy
The latter seems most in accordance with the facts known
specting the origin of the ovary. According to this view,
germinal vesicles and their nuclei exist from the earl
formation of the ovary, and the follicles are developed aro
them for the purpose of maturing and sustaining the ov
and finally of extruding it from the ovarium when it
become fitted for impregnation.

Whether we believe the ovules to be produced from
acini or nuclei of the ovarian parenchyma, we must comp
the ovaria to glands, and consider the ovules and germ c
as their secretory products. In the early formation and de
lopment of all glands, a process takes place, once and for
similar to that which occurs in the ovaria time after time
the maturation of individual follicles and ovules. The c
and follicles of glands, and the epithelial lining from which
special glandular secretion continues to be produced as l
as the gland remains active, are matured at the date of
original development of the gland. In the case of the ova
the developmental process, instead of being perfected at
time of their original formation, is continually going on dur
the reproductive era, and evolving new epithelial and g
minal material. (Fig. 23.) In the analogous organs, the test
the sperm cells which produce the spermatozoa, are still m
distinctly the result of the secretory process in these gland

FIG. 23.



Follicle from the ovary of a newly-born child. 1. Structureless membrane of follicle. 2. Epithelium, or membrana granulosa. 3. Yolk. 4. Germinal vesicle. 6. Vitellary membrane.

The comprehension of the mode in which the ovule esca
periodically from the Graafian follicle, was arrived at quit
slowly, and occupied as many observers, as the anatomy of
ovule itself. Harvey, in his day, drew a comparison betw
menstruation and the oviposition of birds. In 1672, K

kringius advanced the idea that ova, at that time supposed to be identical with the follicles of De Graaf, were thrown off at the time of menstruation. The first positive opinion respecting the rupture of Graafian follicles, during menstruation, appears to have been due to Sir Everard Home. Cruikshank, in 1797, described the case of a woman who had died during menstruation, and in whom the external membranes of the ovary were ruptured at one point. He supposed that from this opening an ovum had escaped into the Fallopian tube. But these were isolated cases. The first body of facts bearing upon the matter was supplied by Dr. Robert Lee, whose first dissection was made in 1831. Dr. Power had, ten years previously, published his hypothesis respecting the periodical escape of the ovule at the catamenial periods. But, as we have seen, the discovery of the ovule, by Baer, was made in 1827. This discovery, which was not recognised by Dr. Lee, soon rendered the rupture of the Graafian follicle an intelligible fact, and the theory of Ovulation in the human female, and in the mammalia, has been completed by the researches of Pouchet, Negrier, Martin Barry, Gendrin, Raciborski, Coste, Bischoff, and others.

It may now, then, be considered as an established fact in physiology, that during perfect menstruation, or the rut or heat of animals, Graafian follicles are ruptured, and ovules discharged. In the human female, it is believed that in ordinary cases the ovule escapes towards, or shortly after, the termination of the menstrual flow, through the pore or fissure usually found in the peritoneal surface of the ovary. Sometimes an ovule escapes from each ovary, or more than one ovule may escape from the ovary of either side. The observations of Dr. Ritchie and others have shown that ova, probably of immature formation, may escape before the time of puberty, and occasionally Graafian follicles are ruptured in the intervals between the catamenial periods. In some cases, the excitement of the ovary during menstruation may not be sufficient to cause the perforation of the follicle so as to admit of the escape of the ovule. The ovule has been detected in the Fallopian tube in persons who have died during, or shortly after, menstruation, by Dr. Letheby, and also by Hyrtl. The time occupied in the descent of the ovule through the Fallopian tube and uterus is not known precisely, and can only be inferred from the number of days after menstruation at which conception may take place. It is evident that several days must elapse before it is discharged from the uterus. Indeed, in the case of virgin or infertile ovulation, it is uncertain, when fecundation does not take place, whether the ovule becomes decomposed, or is discharged externally. Before the advent of puberty, the surface of the ovary is smooth, and the organ comparatively full and large; but at each menstruation, one or more perforations occur, and the organ becomes, in process of time, scarred with numerous cicatrices; so that, in the aged female, it is shrunk and corrugated with the remains of the numerous follicles which have been ruptured during the whole of the child-bearing epoch.

Certain changes occur in the Graafian follicle, or ovisac, at, and subsequent to, the time of ovulation. These changes are more marked when impregnation has occurred, than in cases of virgin ovulation, and result in the formation of the Corpus Luteum. At the time of the escape of the ovule, there is a greater afflux of blood than usual to the membranes of the ovisac, a clot of blood is effused into its cavity, and, according to the views of M. Pouchet, the epithelial lining, or membrana granulosa, undergoes a remarkable development. This membrane becomes thickened by a cell-formation, the hypertrophied cellular layer being at first of a reddish colour, but afterwards becoming yellow. The yellow matter is arranged in the form of plicæ, which diverge from the cavity towards the circumference of the ovisac. The new formation is gradually thrown into folds, or corrugations, by the contraction of the ovisac, and becoming thicker as the development of the corpus luteum proceeds, its internal surfaces at length are brought into contact. In this way the stellate cicatrix found in the centre of the true corpus luteum is formed. (Fig. 24.) Before this apposition has occurred, the fibrinous clot has been decolorized, or converted into fluid, and in either case absorbed. The substance of the corpus luteum is soft, fleshy, and friable, and is permeated with numerous vessels from the external surface of the ovisac, so that the true corpus luteum admits of being injected from the vessels of the ovary. It should be said, that although little difference of opinion exists as to the appearances presented by the corpus luteum, numerous hypotheses have been advanced as to the mode in which the yellow layer, constituting its chief bulk, is formed. The latest evidence appears, however, to be in favour of its origin in the membrana granulosa. Dr. Lee contends that it is a deposit external to the lining membrane, and Mr. Wharton

Jones joins him in this opinion. Knox, Müller, and Dr. Dalton regard it as an hypertrophy of the outer membrane itself, while Kölliker considers it to depend partly upon enlargement of the epithelial lining, and partly upon that of the internal or fibro-cellular layer of the ovisac.

Fig. 24.

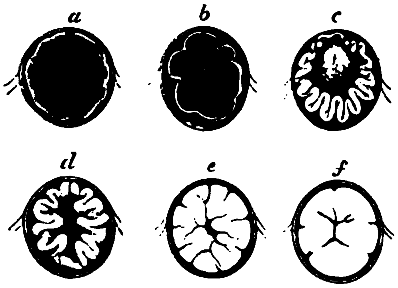
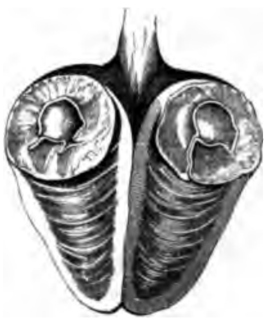


Diagram of the formation of the corpus luteum in a mammifer. *a.* The cavity of the follicle filled with blood. *b, c.* The clot diminishing in size, while the epithelial lining becomes thickened and convoluted. *d, e, f.* Completion of the process.

Fig. 25.



Section of the human ovary, showing the Graafian vesicle at the third month of gestation.

In size and shape, the true corpus luteum, that which follows upon impregnation, (fig. 25,) resembles a small bean, and projects from the surface of the ovary as a mamillary body, occupying from one-quarter to one-half of the entire superfices of the organ. It is largest in the early weeks of pregnancy, and after the third month, it slowly decreases in size until the time of parturition, when it rapidly retrogrades, and at length becomes a mere scar. Its cavity is obliterated, at a variable time, being found in some cases after labour. It is at first filled with a clot, or serum, or the remains of the liquor folliculi, and the aperture through which the ovule has escaped sometimes remains pervious for a considerable time after impregnation.

Upon the escape of an ovule from a Graafian follicle in the virgin the changes described occur, but to a less extent than when impregnation has taken place, and a false corpus luteum is formed. The membranous layer is less considerable, and instead of being of a yellow tint, is of a dull-red colour. According to Dr. Dalton, who has carefully investigated this subject, it reaches its greatest development about three weeks after ovulation, and from this time rapidly disappears, leaving no vestige of its existence beyond a small scar. In the case of the virgin corpus luteum, other Graafian follicles are passing on to maturity, *pari passu* with its development, whereas in the true corpus luteum the occurrence of gestation suspends the maturation of ovules. As a general rule, the virgin corpus luteum is much smaller than the body formed after impregnation; but cases occur in which the spurious equals the true corpus luteum in size. The differences between the corpora lutea of the virgin and of the impregnated female show that in the case of the latter there is at the time of ovulation a greatly increased vascularity, and that during gestation the corpus luteum shares in the excitement incident to the gravid uterus. Other formations besides the corpora lutea of the nulliparous female have been mistaken for the true corpora lutea. Small tubercular masses are sometimes found having a certain resemblance to these bodies, and after the decline of the catamenia, the follicles which have not reached maturity during the era of child-bearing, collapse, and form cicatrices which have sometimes been thought to resemble the genuine corpora lutea.

During the periodical process of ovulation, there is a great determination of blood to the whole ovary. This has been observed in cases in which the ovaria of women who have died during menstruation have been examined. It has also been observed during life. Dr. Oldham had a most interesting case at Guy's hospital, in which the ovaria were situated in the inguinal rings, and could be readily examined by the finger. He found that at each catamenial period one or both of the ovaria became painful, and greatly increased in size; this increased size and sensibility lasted as long as the catamenial flow, and then diminished.

CHAPTER V.

MENSTRUATION.

During the whole of the childbearing era, women are the subjects of a sanguineous discharge every month, except during the times of pregnancy or lactation. The advent of this discharge is the chief external sign of the appearance of puberty, and it occurs in temperate latitudes at about the age of fourteen or fifteen. In former times, the most exaggerated notions were entertained respecting the influence of climate in determining the early or late appearance of the catamenia. It was supposed that towards the arctic circle the catamenia occurred only in mature womanhood, and were then frequently represented by a colourless discharge, or only appeared during the summer months; while it was believed that in the torrid zone, children of tender age menstruated and became wives and mothers. These views have been corrected by modern researches, and especially by the investigations of Mr. Roberton, of Manchester. The results of his inquiries, and those of other observers, show that the difference between the date of the first appearance of the catamenia in the Hindoo female, in whom the influence of heat of climate is strongly marked, and the natives of this country, is about two years; the average age at the first menstruation being about thirteen in Hindostan, and about fifteen in England. A table of the time of the first appearance of the menses in Labrador has been obtained by Mr. Roberton, and the mean age, at the first menstruation, is nearly sixteen. Probably this variation of three years between the Hindoo and the Esquimaux female, is amongst the greatest that can be obtained, as the result of climatorial influences, in different parts of the world. A variation of three years in the time of the commencement of a function, occurring between the ages of thirteen and sixteen, and lasting about thirty years, is, however, a very considerable one; and, while correcting old errors, we must be careful not to ignore the real effects of climate and temperature in hastening or retarding puberty. Dr. Tilt has made a very extended inquiry into this subject, and the results of his tables show that there is in fact an average difference of nearly three years between the date of the first menstruation in hot and cold climates. Perhaps, if any criticism could be ventured upon respecting the valuable work of Mr. Roberton, and those writers who have adopted his views, it would be, that they have somewhat tended to make the influence of climate upon the functions of reproduction seem less than they are undoubtedly proved to be.

It is found that other agencies, besides those of climate, affect the age at which menstruation commences. The catamenia appear earlier in the children of the rich than of the poor. The influences of a large manufacturing town like Manchester also hasten the appearance of puberty. M. Brierre de Boismont ascertained that menstruation begins earlier in Paris than in the smaller towns of France, and in these again at an earlier age than in the wholly rural districts. Raciborski believes that race has an influence upon puberty, apart from climate—as, for instance, that the English child, reared in India, menstruates at the time she would have menstruated in this country; but that if a Hindoo child be brought to England, she will menstruate as early as though she had remained in Hindostan. It is also believed that Jewish females menstruate earlier in cold latitudes than the ordinary population. Probably climate, hygiene, temperament, and race, all exert an influence in promoting or retarding puberty, but within a narrower range than was formerly supposed. Cases are met with occasionally of children menstruating, and having sexual feeling, at a very early age; but these must be considered as irregularities, having but little bearing upon the function as ordinarily performed.

The decline of menstruation, termed the Change of Life, or catamenial climacteric, generally occurs between the ages of forty-five and fifty; consequently, the catamenial era spreads over from thirty to thirty-five years. The time of the decline varies in different individuals; sometimes it occurs as early as thirty-five, or even before that age; at others it lasts up to sixty, or even beyond. Putting thirty years as the time during which a healthy female should have the menstrual periods, and supposing them to occur every four weeks, their number would be three hundred and ninety: 30 × 13 = 390. But in married and childbearing women, much of this time is occupied in gestation and lactation. During pregnancy, as the rule, the catamenia are absent, the cases in which a regular sanguineous discharge occurs during the whole of pregnancy being exceedingly rare. A discharge of blood for one or two periods after the occurrence of impregnation is more common. The great majority of women do not menstruate during lactation, but menstruation during suckling is by no means so unusual as the occurrence of this function in pregnancy. Many women habitually menstruate as regularly during lactation as at other times. It has been remarked by some observers, that the intellect of woman does not reach maturity until after the final cessation of the catamenia; and it has been instanced as a sign of the superiority of the human race, that only a limited portion of the life of the female should be devoted to child-bearing.

It is necessary to possess exact ideas respecting the times of the occurrence of a periodical function like that of menstruation. The catamenia, or menses, as the names imply, are said to return once a month in ordinary cases. Some authorities speak of solar, others of lunar months, as the period observed by the catamenia. Strictly speaking, the Solar month—that is, the time occupied in the passing of the sun through one of the signs of the zodiac—is nearly thirty days and a half. The Lunar month, or the time between one new moon and another, is twenty-nine days and a half. The Calendar month varies from twenty-eight to thirty-one days. The Catamenial month is different from any of these, and consists of the common month of four weeks, or twenty-eight days, dating from the commencement of one period to the commencement of another. This is the ordinary periodicity observed by the catamenial function, or that which obtains in the great majority of women. Many females become unwell on the same day of the week for a long time, without any irregularity. In women who menstruate two or three days only, the interval between the cessation of one period and the beginning of another is longer, and in those who are many days unwell, shorter; but the length or brevity of the duration of the discharge does not usually affect the time of its return. In some women, the monthly periodicity is so continuous and exact, that the times between successive pregnancies, if reduced to days, are found to be multiples of twenty-eight. Cases are not uncommon, however, in which the catamenia return regularly at longer or shorter intervals than twenty-eight days, some women being unwell every six weeks, and others every two or every three weeks, but there is generally a tendency to observe some multiple of a week. In certain habits, a leucorrhœal discharge constantly occurs, and lasts for three or four days, at the fortnightly interval between the regular periods. Although there is a very general tendency to regularity in the performance of this function, it is very common to find occasional variations to the extent of a few days.

Each "Period," as it is now common with educated women to call the monthly discharge, usually lasts in healthy subjects four or five days. Five days may be taken as the ordinary duration of the catamenial flow; but every woman has her constitutional peculiarity in this respect, some menstruating two or three days only, others always remaining unwell a week or more, such variations in women of different temperament and constitution being quite within the limits of health. The catamenial fluid consists chiefly of blood, modified to some extent by the ordinary utero-vaginal secretions, and other matters derived from the uterus and vagina. This is the result both of microscopical and chemical examination. The menstrual fluid has been examined with the microscope by MM. Donné and Pouchet, Dr. Hassall, and others. It has been found to consist of blood globules and the fluid parts of the blood, with mucus from the glands of the cervix, cylinder epithelium; granular matter from the cavity of the uterus, and scaly epithelium from the vagina. Dr. Whitehead has pointed out that the menstrual fluid as it escapes from the os uteri is alkaline, but that it becomes acid when mixed with the acid vaginal secretion, and this acidity, as formerly mentioned, tends to prevent its coagulation and decomposition in passing through the vagina. The menstrual fluid has been examined chemically by MM. Denis, Franz, Simon, Bouchardat, Rindskopf, and Dr. Letheby, and shown to consist chiefly of the elements of blood and mucus. An estimate of the amount of the discharge has been made by Dr. Meigs, who rates it at from four to six ounces at each period; but this can only be approximative in the case of a loss which, like the number of days through which it continues, varies in different individuals. It was long supposed that menstrual differed from ordinary blood, in the absence of fibrine in the former. It is now, however, understood that the cause of the non-coagulability of the catamenial fluid, and the apparent deficiency of fibrine, depend on the acid secretions of the vagina. When contraction of the os uteri exists, and the menstrual blood does not escape readily, it coagulates in utero, and is expelled with pain in the form of clots; or, if the fluid is in quantity sufficient to neutralize the effects of the vaginal mucus, it coagulates after its escape externally. I use the terms "discharge," "loss," or "flow," in preference to that of secretion, because the catamenia appear to be essentially different from the products of any secretory process.

The influence of Menstruation, and the allied process of Ovulation, upon the female economy is very great. The beauty of form incident to womanhood; the marked characteristics of the female sex and the development of the affections, are intimately connected with, and dependent upon, the healthy appearance and performance of these periodical functions. The periods are commonly preceded by hypogastric and lumbar uneasiness or pain, tumidity of the breasts, a dark appearance round the eyes, and a peculiar vaginal smell, especially adverted to by M. Pouchet, which has been termed the vaccine odour. There is also in many women a tendency to relaxation of the bowels for a day or two before the discharge appears. Women are generally more hysterical and irritable at this than other times. These symptoms are all relieved by the healthy catamenial flow; personal appearance is improved, and a new stimulus is imparted to all the organs of the body.

The condition of the whole uterus is modified at the catamenial periods. The determination of blood to the organ renders it larger and darker in colour than it is at other times. It is firmer to the touch, and lower in the vagina than usual. The Fallopian tubes partake of the turgescence, and have been observed almost black from engorgement. In ordinary cases, the canal of the cervix and the os uteri are somewhat dilated at, and for a few days subsequent to, the menstrual date. This renders it easier to introduce the uterine sound just after the period than at any other time. In other cases there is a sphincteric contraction of the os uteri, similar to tenesmus, which constitutes one of the forms of dysmenorrhœa. For a short time after the flow there is a marked increase of sexual feeling, and many women in whom the aphrodisiac tendencies are moderate, possess little or no excitability at other times. The intention of this increased sexual sensibility, at the time when the ovule is ready for impregnation, and the uterus to receive the products of fecundation, is sufficiently evident. It is at this time also, in those whose feelings are intense, and unbridled by the higher qualities of the mind, that aberrations in regard to sex, and tendencies to nymphomaniacal excitement, occur. It is indeed difficult to say, in many cases of this kind, how much should be attributed to disease, and how much to moral delinquency.

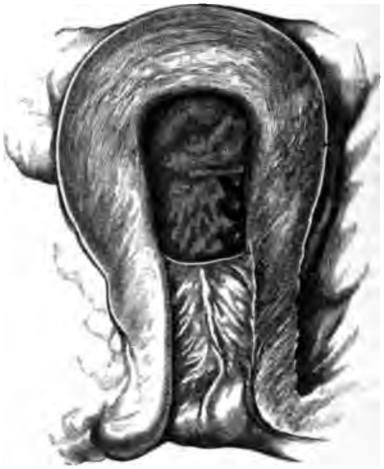
The cause of menstruation must be referred to the ovaria. These are the prerogative and ruling organs, a point insisted upon with great force and justice in the writings of MM. Pouchet and Chereau in France, and by Dr. Tilt in this country. It is found that in women with a proper development of the ovaria, breasts, and external organs of generation, and in whom the sexual feeling is strong, but in whom the uterus is congenitally deficient, a monthly nidus occurs, consisting of pain in the back, and other symptoms which indicate that ovulation occurs regularly, although no sanguineous discharge takes place. In these distressing cases, there is occasionally a show from the vulva, or an attack of epistaxis, or bleeding from some other part, at the periods of ovarian excitement, but nothing like the menstrual flow. On the other hand, in cases where the ovaria have been extirpated, menstruation is effectually arrested, although the uterus remains perfect. This happened in a case in which Mr. Pott removed the ovaries in an operation on a patient at St. Bartholomew's Hospital. Dr. Frederick Bird has also informed me, that in a case in which he removed both ovaria, in double ovarian disease, and where the patient recovered, permanent amenorrhœa was the result. We must look, then, to the ovaria for the exciting cause of menstruation, and this function is evidently subsidiary to that of ovulation.

Symptoms in some degree analogous to those of menstruation occur in the lower animals at the dates of ovulation. A comparison has been made between menstruation and the determination of blood to the comb of the domestic hen, the genitals of the pigeon and birds of the parrot tribe. In many of the lower mammalia, discharges from the genitalia take place at the time of the rut or heat, during or immediately after the occurrence of ovulation. In some of the quadrumana, sanguineous discharges have been observed; and it is believed that in the monkeys the œstrum has a monthly periodicity. Dr. Hille, a Dutch physician of Surinam, possessed a female monkey, which was the subject of a sanguineous discharge, lasting three or four days, every month. In others, as the Macacus libidinosus, the callosities near the anus, and the whole of the parts below the tail, become periodically of an intensely vivid red colour, and present an appearance, to use the words of M. Coste, of an immense phymosis. The phenomena of œstruation are more marked in wild than in domesticated animals; and in those which only œstruate once a year, Mr. Roberton has pointed out that the date of œstruation occurs at such a time as to admit of the completion of gestation and parturition in the spring season. Little is known of the gestation of the quadrumana; but in the lower mammalia, the changes which occur in the lining membrane of the uterus, in æstruation and gestation, could not well be the same as those belonging to the human female, because in the lower animals that structure which answers to the decidua of the human female is a permanent organ.

Divers opinions have been held respecting the exact source of the menstrual flow. It has been referred to the ovaria, the Fallopian tubes, the cavity of the body of the uterus, the os and cervix uteri, and the vagina. Very recently, M. Ch. Judee has published the result of three autopsies of women who died near the menstrual period, in which he states that the mucous surface of the os was abraded, and he considers this a proof that the menstrual blood comes from the lips of the os uteri. I have no doubt these were really cases of abrasion, or ulceration, of the os uteri, and in such cases there is at the menstrual period a discharge of blood from the diseased surface, as well as from the interior of the uterus. In such cases, the os uteri becomes, for a time, a menstrual ulcer, and the secretion of pus is converted into a discharge of blood. All the exact evidence we possess points, however, to the cavity of the body of the uterus as the true seat of menstruation, and source of the discharge. The catamenia may often be seen escaping from the os uteri, in examinations with the speculum. In cases of procidentia the whole process may be watched, and in these cases the fluid always comes from within the uterus. In cases of inversion, we have a still more positive proof, as the blood may be seen exuding from the surface of the inverted organ. The commencement of the flow at each period takes place very gradually. In examining patients, I have sometimes seen the first trace of the sanguineous discharge at the os uteri, but it has been twelve hours or more before it has appeared externally. The quantity of discharge being at first small, it passes down the vagina very slowly. Probably the period ceases in the same gradual manner, and has disappeared from the os uteri some time before the discharge is lost at the ostium vaginæ.

Within the last two years I have had opportunities of examining several uteri taken from women who had died during the catamenial flow. In each of them I found the mucous membrane of the body of the uterus either in a state of dissolution or entirely wanting. In one case, that of a woman previously in good health, who died suddenly from a fit of apoplexy while menstruating, and whose uterus was kindly sent to me by Mr. Filliter, of the Marylebone Infirmary, the mucous membrane was altogether gone. At the upper part of the cervix uteri the break in the mucous membrane was very apparent. In the cervical canal the mucous membrane was perfect; but at the os uteri internum, it ceased as abruptly as though it had been dissected away with a knife above this point. Blood was oozing at numerous points from broken vessels in the sub-mucous tissue. I had the assistance of Dr. Handfield Jones in examining this uterus with the microscope,

FIG. 26.



Uterus of a woman who died from apoplexy during the catamenial flow. The whole of the mucous membrane of the body of the uterus is wanting.

and we could find no traces of the epithelium or of the utricular glands. The surface of the cavity of the body of the uterus was exactly similar to that which may be seen after abortions, in which the decidua, or, in other words, the developed mucous membrane, has been discharged. The submucous surface was a pulpy mass, in which epithelium, the ends of vessels, broken tubes, blood globules, and mucous corpuscles were all that could be distinguished. I compared this uterus with that of a woman who had died after an abortion at the third month, and the appearances in the original two cases were precisely similar. Dr. Vernon informs me that he has recently met with the uterus of a woman who died during the catamenial flow, in which the appearances closely resembled those now described.

The state of the uterine mucous membrane during menstruation has occupied the attention of many other observers. It has generally been described as thicker and more swollen during the catamenia than at other times. It should be mentioned, however, that descriptions of the uterus a few days before or after the menstrual flow can have little bearing upon this subject, and it is a rare occurrence to get the uterus of a woman who has died in the middle of healthy menstruation. No safe conclusions can be drawn from the cases in which women suffering from severe disease have a sanguineous discharge from the uterus at the time of death. It is not very uncommon for women to be affected with a red-coloured discharge at the time of death. Prof. Simpson, in 1846, in his paper on the expulsion of the entire mucous membrane in certain cases of Dysmenorrhœa, drew a comparison between ordinary menstruation and the process of digestion, in which the epithelial layer is shed and removed after every meal. M. Pouchet has supposed that a decidual membrane is formed during each catamenial period, and discharged in the shape of an albuminous plug ten or twelve days after the cessation of the flow. Kölliker states that the mucous membrane becomes thickened during menstruation, the blood escaping from the ruptured superficial capillaries, and the epithelium of the cavity of the body is in great part thrown off; but he considers it as abnormal if the whole or part of the entire mucous membrane should be detached. Müller compares the change in the mucous membrane of the uterus during menstruation to moulting, attended, perhaps, by the formation of a new epithelium. A case recorded by Dr. Janzer has been often quoted. It was that of a girl murdered four days after menstruation. He describes the mucous membrane as somewhat thickened, and easily lifted from the surface by the handle of the scalpel. It was composed of the utricular glands, arranged perpendicularly, side by side, and covered by cylinder epithelium. This observer concludes that during menstruation the mucous membrane of the uterus presents the same characters as in the early part of gestation. Such cases, however, really prove nothing with respect to the condition of the mucous membrane during the actual presence of menstruation. In an organ like the uterus, the most important changes may occur in the space of four or five days.

It appears to me to be in accordance with what I have observed in uteri examined during the menstrual period, the facts connected with membranous dysmenorrhœa, and the detachment of the decidua in abortion and parturition, to suppose that the mucous membrane is in great part or entirely, broken up and its *débris* discharged, during each menstruation. The blood is probably exuded during the breaking up of the mucous structure, and the duration of the menstrual period represents the time occupied in this periodical decadence and renewal of the mucous membrane of the body of the uterus. The new mucous membrane becomes converted into the decidua in the impregnated female. The explanation of the absence of sanguineous discharges in the lower animals is probably supplied by the fact, that no periodical destruction and renovation of the uterine mucous membrane occurs in the lower animals. The mucous structure, which acts the part of the decidua, in them remains permanent, and is not removed even after parturition.

In cases of membranous dysmenorrhœa, we have proof of the exfoliation of the mucous membrane in an entire form, or in detached pieces. This may occur every month for many years, a new mucous membrane being developed after each menstruation. After abortions and after parturition, we know that the old mucous membrane is thrown off, and a new one formed. According to the view I have stated, a new mucous membrane is formed every month as part of the process of preparation for the reception of a fecundated ovum; not that the aptitude for the reception and implantation of the ovum belongs only to the newly-formed mucous membrane, though it is probably greater at this time than at others. The mucous membrane may become the seat of the changes consequent upon impregnation just before a menstrual period, and in cases where menstruation is suspended. According to the view now stated, the mucous membrane of the uterus becomes excrementitious every month, and is discharged from the cavity of the uterus in a state of disintegration. The uterus appears to gain a new mucous membrane, by a process similar to the reproduction of lost parts.

Such a doctrine may at first sight appear startling, but we have always had a similar condition, during the menstrual period, under our eyes, in cases of vicarious menstruation. In these cases, an ulcer upon any part of the surface of the body may skin over, or assume healthy granulations, during the intervals of menstruation, but on the occurrence of the period, the newly-formed skin gives way, or the healthy granulations slough, and blood exudes from the surface for several days; after which the ulcer heals, or puts on a healthy aspect, until the approach of the next catamenial period. I have at the present time a patient with a menstrual ulcer upon the dorsum of the tongue, in whom the sore heals partially or entirely between the periods, but at the catamenial dates the surface gives way, the sore becoming deepened, and exuding blood, while the catamenia are flowing. We have only to consider similar phenomena as occurring to the mucous membrane of the body of the uterus, and we have a reasonable explanation of the mode in which this peculiar function is performed, and of the source of the sanguineous discharge.

CHAPTER VI.

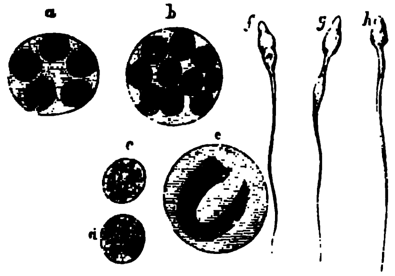
CONCEPTION, AND THE EARLY DEVELOPMENT OF THE OVUM.

In a former chapter, the anatomy of the Ovule has been traced up to the point of its fission or emission from the ovarium, considering it chiefly with reference to ovulation and menstruation in the unimpregnated state. It now becomes necessary to study it in relation to the act of fecundation, and the early changes which occur in the impregnated condition. As the ovule approaches maturity, and makes its exit from the Graafian follicle, a remarkable change occurs in the germinal vesicle. It is believed by almost all observers, either to disappear or to become entirely transformed. Dr. Martin Barry asserts that it does not disappear, but returns again to the centre of the ovule, where it becomes changed by a process of cell-development, which ends in the production of two cells in the centre of the yolk, from which cells the embryo is afterwards developed. It appears, also, from the later researches of Mr. Newport, that there is a partial return of the germinal vesicle towards the centre of the yolk, and that considering the germinal vesicle as a parent cell, its nuclear particles, which form the germinal spot, are developed into secondary cells; these again are transformed into cells of tertiary formation, and so on, until the germinal vesicle has been metamorphosed into a mass of cells, which leads to the rupture and diffluence of the walls of the parent cell, or germinal vesicle. From some one of these cells it is believed that a larger cell, the future Embryo-cell, occupying the site of the macula germinativa, and constituting the true Germinal point of the future Being, is developed. It is, however, as yet uncertain whether the embryo-cell, or vesicle, which replaces the germinal vesicle, is formed just before, or just after, the act of fecundation.

It is necessary in this place to glance briefly at the male element of impregnation. The part of the seminal fluid actually required for conception is the Spermatozoa. For a long time the spermatozoa were thought to be distinct animalcules, but they are now known to be particles *sui generis*, developed within the seminal cells found in the secretion of the testis before it leaves the gland. While they remain within the cells, these spermatic filaments are arranged in bundles, but in the passage of the fluid from the gland through the efferent apparatus, the cells rupture and set free the spermatozoa. Each spermatozoon consists of an oval and flattened body, and a filamentous portion, or tail. The width of the body is about $\frac{1}{5000}$th part of an inch, and the length of the entire particle is from $\frac{1}{400}$th to $\frac{1}{600}$th of an inch. Kölliker believes the spermatozoa to be allied to ciliated cells, and that they move in the fluid semen, or traverse the mucous membrane of the genital passages, by a succession of smart lashing movements. It has been proved by direct experiments—such as filtering the semen, and using the spermatozoa, and the pure liquor seminis, separately, in the impregnation of the ova of amphibia—that it is the spermatic particles and not the liquor seminis which form the real agents of fecundation.

Thus, then, on the part of the female, we have the ovule produced in the ovarium, the essential part of which is the germinal vesicle or germ cell. On the part of the male, we have the spermatic fluid, the essential part of which is the seminal vesicle, or sperm cell, produced in the testis. (Fig. 27.) The bundle of spermatic particles, or spermatozoa, formed in the sperm cell, correspond with the nuclear particles forming the macula germinativa, or germinal spot, of the germ cell. The spermatozoa may be considered, in fact, as the nuclear particles of the sperm cell. The bursting of the sperm cell and formation of the spermatozoa, on the one hand, and the development of the nuclear particles of the germ cell into the cellular mass which occupies the place of the germinal vesicle after its rupture, is the highest point of development to which the male and female elements can reach, if fecundation does not occur. It will be observed that several generations of cells have followed upon the germinal vesicle and its nucleus, before the ovule has been rendered ripe for impregnation; and the spermatozoa are also the secondary or tertiary products of the cells found in the secretion of the testis. The real origin, then, of the ovum is found in the union of the Sperm Cells and Germ Cells supplied by the male and female parents. There is no doubt, that both in the case of the sperm cells and the germ

FIG. 27.

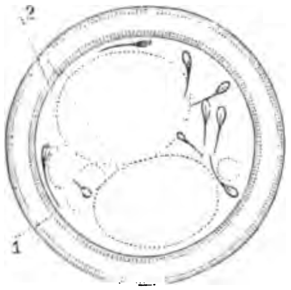


a, b. Sperm cells, containing nuclei, each nucleus having within it a spermatic filament. *c.* A nucleus, with nucleoli. *d.* Nucleus, with spermatic filament. *e.* A cell, with a bundle of spermatic filaments. *f, g, h.* Spermatic filaments.

cells, they must be looked upon as the result of a process of secretion in the testes and ovaria respectively.

We now approach the act of Fecundation or Impregnation, and recent researches have gone far to solve this, one of the most mysterious processes in the arcana of Nature. In the fecundation of the vegetable ovum, it has long been known that the moving spermatic particles of the pollen cell penetrate the ovum, and unite with the contents of the germ cell. Prevost and Dumas believed that the spermatozoa penetrated the ovum bodily, and became metamorphosed into parts of the animal embryo. In 1843, Dr. Martin Barry published, in the "Philosophical Transactions," an account of the actual penetration of the ovum of the rabbit by the spermatozoa, and he demonstrated the fact to the satisfaction of Dr. Sharpey, Mr. Owen, and Mr. Grainger. He believed that the spermatozoa penetrated the yolk, and there became divided into many parts. The following figure from Dr. Barry's paper represents the spermatozoa after they have entered the ovum. (Fig. 28.)

FIG. 28.



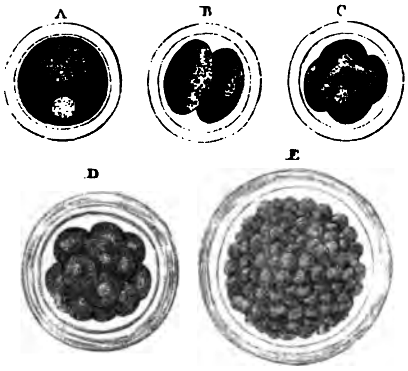
An ovum of the rabbit, taken from the Fallopian tube, twenty-four hours after leaving the ovary. 1. Zona pellucida. 2. The germ, consisting of two large cells. Several smaller cells, and numerous spermatozoa, are visible.

This view of Dr. Martin Barry was combated by many observers, particularly by Bischoff. Mr. Newport, in his first investigations into the impregnation of the ovule of the frog, published in 1851, did not agree with Dr. Barry. He believed that the moving spermatozoa approached the ovule, became applied to the surface, and disappeared in that situation by a process of diffluence or disintegration. He subsequently modified this opinion, and became convinced that the spermatic particles are imbedded in the walls of the ovule, and perforate the vitellary membrane in large numbers. Keber discovered that in the fresh-water mussel the spermatozoa pass into the interior of the ovum by a canal or opening in the walls of the ovum. The researches of Keber have been verified by

Dr. Martin Barry and Dr. Webb, of Lowestoft, and confirmed by Meissner and others. Müller has described a funnel-shaped canal in the ova of every species of Holothuria, having probably the same function as the canals discovered by Keber. Lastly, Dr. Nelson has investigated the reproduction of the *Ascaris mystax*, an entozoon found in the intestine of the cat, and demonstrated the penetration of the ovule by the spermatic particles in the clearest manner. These observations of Dr. Nelson have the high authority of Dr. Allen Thompson in their favour. It may be considered, then, as proved, that the spermatozoa penetrate the ovum, and come into positive contact and unite with the contents of the germ cell. Impregnation does not, however, depend on the penetration of the ovule by one spermatozoon, but by considerable numbers of spermatozoa. Mr. Newport found that the greater the number of spermatozoa in apposition with an ovule the more certain its fecundation became. Dr. Nelson observed that in the *Ascaris mystax* a sufficient number penetrated the chorion and vitellary membrane, to form a ring round the germinal vesicle. It is not by the influence of particle upon particle, but of mass upon mass, that the phenomena of impregnation appear to be accomplished. After the penetration of the ovule, the spermatozoa lose their motor power, become disintegrated or dissolved, and disappear; not, however, until they have communicated to the ovum that wonderful force which leads to the formation of the future being, but without which the ovule dies like any other simple animal cell.

The Ovule, having thus been converted into the Ovum, by the process of fecundation, we have now to speak of the earliest phenomena observed in the development of the new organization. The first change which is known to occur is the cleavage or segmentation of the yolk. The embryo cell first elongates, then becomes violin-shaped, and afterwards separates into two cells by spontaneous fission—an observation first made by Swammerdam. With this division of the embryo cell, the yolk divides into two masses, and the two cells are now in the centres of the two portions of the yolk. By a similar process, the two cells divide into four, and these again into eight, and so on, the yolk combining with the individual cells, until the process of segmentation is completed, and the product of the embryo cell and the yolk form together a homogeneous mass of cells, termed, from its endowments, the Germ-Mass, and which, from the appearance it presents, has been called by some authors the mulberry mass. In the formation of the germ-mass, the cells have evidently multiplied by the assimilation and conversion of the yolk. This germ-mass is the plastic material out of which the whole organization of the fœtus is gradually evolved. (Fig. 29.)

FIG. 29.



A. Ovum, with first embryo cell. B. Division of embryo cell, and cleavage of the yolk round it. C. Second division, or segmentation. D. Farther division. E. Germ mass or blastoderm forming.

Prof. Owen is of opinion that not all these germinal cells are consumed in the formation of the individual fabric, but that, in the mammalia for instance, a certain portion is reserved, and that this reserve becomes the ovarium or testis of the future animal. In the amphibia, and still lower in the scale, the remnants of the germinal cells not only go to form the sexual organs, but are located in different parts of the body, and become the agents in the reproduction of lost limbs or organs. This philosophical view of Mr. Owen is combated by Dr. Allen Thompson, one of the ablest embryologists in this country, on the ground that at an early period of development no difference can be seen between the blastema or commencing structure of the ovaria or testes and any other organ. Still the opinion of Mr. Owen upon this point cannot but carry great weight. It is probable that the blastema of all organs contain, in the first instance, germinal cells, which are gradually exhausted in the development of the tissues, but which in the ovaria and testes are reserved for the evolution of new individuals. If we believed, with Mr. Owen, that in each female a part of the residual germ-mass goes to the formation of the ovaria, and the evolution of germs in a new generation, we might infer that the human race is still almost in its infancy. The changes in these germ cells, occurring but once in every generation, if multiplied by the generations of men which have yet lived upon the earth, are infinitely less in number than the changes which occur in particular cells in the life-time of an individual. The epithelial cells of the digestive tube may be cited as an example, in which new progenies of cells are produced and destroyed after every ingestion of food.

After the formation of the germ-mass by the process of segmentation, those cells which are nearest the surface, and immediately under the zona pellucida or vitellary membrane, become aggregated together at one part of the ovum, so as to form a layer, which constitutes the Blastoderm, or Germinal Membrane. This membrane, in the first instance, divides into two layers—the external or Serous Layer, and the internal or Mucous Layer, for a knowledge of which division we are indebted to Pander, of Wurzburgh. Subsequently, other cells of the germ-mass collect between the serous and mucous layers, and arrange themselves into a third layer, which is termed the Vascular Layer. The serous layer gives origin to the Vertebral Column, the Brain and Spinal Marrow, the Extremities, and the general Skeleton. In the mucous layer arises the Mucous Membranes and the Glands; while in the vascular layer, the Heart and Vascular system originate. In forming a proper idea of these layers, the student must bear in mind that they are not flat layers, but are three spherical membranes contained within the external membrane of the ovum—that is, the vitellary membrane, or zona pellucida. On one aspect of the sphere, these membranes become thickened by the accumulation of cells, and in this thickened portion of the membrane the rudiments of the fœtus are formed. Attention must now be given to this thickened part of the several layers, and the student should consider himself as looking at a circumscribed portion of their spherical surfaces. The dense area referred to, constitutes the Area Germinativa (Fig. 30), which is first round, then oval, and subsequently pyriform in shape. In the centre of the area germinativa, the cells of the serous and mucous layers become fewer in number, so as to render them comparatively transparent, thus forming a space called the Area Pellucida. Around this pellucid space a boundary is formed by an accumulation of cells in the vascular layer, and this circle is called the Area Vasculosa. In the centre of the area pellucida, and in the serous lamina, the first sign of the fœtus appears in the form of a transparent groove. This groove, which is the Primitive Trace, is surrounded by two elevated ridges, called the Laminæ Dorsales. (Fig. 31.) The primitive trace may be said to represent the future cerebro-spinal nervous centres, the dorsal laminæ, the cranium, and vertebral column. The ridges or elevations of the serous layer, constituting the laminæ dorsales, approach each other as the process of development goes on, and unite above, in this way closing over the groove already described. (Fig. 32.) Thus the vertebral canal is formed by the fusion of two processes of the serous layer at their apices. This method of forming separate cavities, from the layers out of which the fœtus originates, deserves special attention and study, as it is repeated again and again as the development of the ovum proceeds.

FIG. 30.

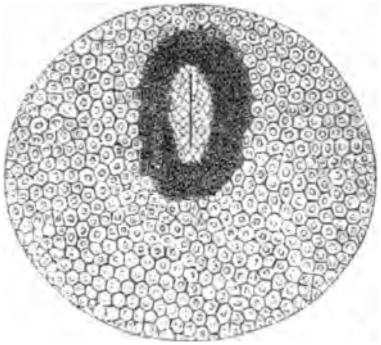


Diagram of area germinativa. In the centre, the primitive trace. Immediately surrounding it is the area pellucida, bounded by the dark area vasculosa.

While the upper portions of the dorsal laminæ are thus closing over to form the vertebral canal, the under portions, which constitute the Laminæ Ventrales of Baer, elongate to form the ribs and abdominal walls, and they have the same tendency to meet and unite in the medial line. In this way the abdominal and thoracic cavities are formed, and the mesial raphe indicates in after life the place of union. Thus the vertebral and cranial cavities, and the cavities of the thorax, abdomen, and pelvis, all lined with serous membranes, are inclosures separated off from the general cavity of the primordial serous layer of the ovum. The limbs, with the joints and their fibro-serous linings, are also derived from the same membrane, and possibly the remarkable sympathies of the joints with the larger fibro-serous membranes in disease, as in articular Rheumatism and Pericarditis, may be referred to their common origin. It is easy to understand, that if the closing in of the spinal canal by the laminæ dorsales should be incomplete, we have spina bifida or hernia cerebri as the result; or that, if the lower laminæ do not meet in the median line, we have cleft palate, hare lip, deficiency in the walls of the thorax and abdomen, and other malformations depending on insufficient development at this early period. At this epoch of development it is, that various monstrosities, arising out of the union of twin fœtuses, occur. If two impregnated ova join anteriorly, before the closing in of the abdominal and thoracic

FIG. 31.

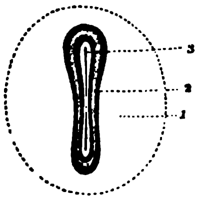


FIG. 32.

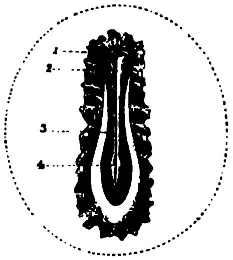


FIG. 31.—1. Area pellucida. 2. Laminæ dorsales. 3. Primitive trace or groove

FIG. 32.—1, 2, 3. Commencement of cerebrum, cerebellum, and Spinal marrow. 4. Commencement of vertebral column.

cavities, or posteriorly before the arching in of the vertebral and cranial canals, we may have an abdominal or spinal canal common to both. It is upon this principle, applied to the serous, vascular, and mucous layers, that all the varieties of double monster are to be explained. In the case of the African twin, recently exhibited in this country, the junction was at the sacral bones, and the ova must have united together at the sacrum, before the arching in of the sacral portion of the vertebral canals, so that the posterior aspects of the two sacral bones became fused together, the vertebral column being separate at every other point.

In the vascular layer, and in that part of it which has been referred to as the area vasculosa, surrounding the area pellucida, the first blood-channels are formed, by the unions of files of cells, and the obliteration of the cell-walls at the points of union; the first blood discs being formed, according to Dr. Carpenter, from the nuclei of the cells which have united to form the vessels. These vessels increase and enlarge, and are destined at first to carry to the embryo the nutriment absorbed from the yolk and from the chorion, the formation of which will hereafter be adverted to. The heart is formed in the same manner as the first bloodvessels, from cells, and retains for some time its cellular character. The vessels are, however, first formed, and the flow of the earliest blood globules is not from, but towards, the Punctum Saliens, or commencing heart. From this beginning, the circulating apparatus is gradually developed, passing through the phases which are permanent in fishes and amphibia, to reach, at the time of birth, the mammalian type.

Early in the formation of the embryo, the Amnion—the envelope belonging essentially to the ovum—begins to appear. It is formed in the following manner:—Beyond the two extremities of the ovum, and on the outside of the area pellucida, the serous lamina projects in the form of two hollow processes, which gradually arch over the whole of the fœtus, so that the dorsal aspect of the embryo is entirely covered by two layers of the serous lamina. (Figs. 33, 34.) These processes meet in the centre, and unite together. At first the processes are, at their origin, separated to a considerable extent on the ventral surface of the embryo, but they gradually approach each other at the umbilicus, and ultimately surround the elements forming the umbilical cord. Of the two layers of which the amnion is formed, one surrounds the embryo, and constitutes its proper envelope; the other becomes adherent to the external or maternal membranes. The cavity of the amnion

FIG. 33.

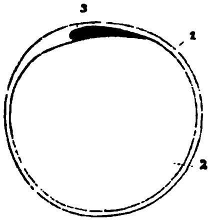


FIG. 34.

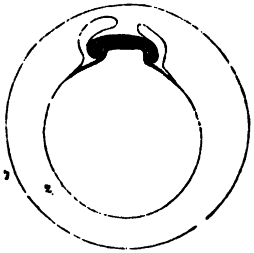


Fig. 33.—Diagram of early ovum. 1. Serous lamina. 2. The yolk. 3. Embryo.

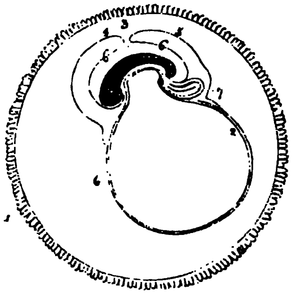
Fig. 34.—Diagram showing the commencement of the amnion. 1. Chorion. 2. Yolk sac. Two folds of serous membrane are rising at the extremities of the embryo, to form the amnion.

becomes filled with a watery secretion, and the embryo is thus suspended in a fluid medium, which affords many advantages during the progress of utero-gestation. From the time when the amnion is first formed, to the date of parturition, this membrane and the bulk of the fluid it contains continue to increase. The outward pressure of the amniotic fluid seems to be the chief agent in promoting the extension of the external membranes of the ovum. It is worthy of remark that the secretion of a large quantity of fluid by a serous membrane, which secretion is closely allied to the dropsies of the serous cavities, should in the ovum be a purely physiological process. Sometimes the amniotic fluid is in excess when we have what is termed dropsy of the amnion. It will not be forgotten that the amnion, like the serous lining of the vertebral and cranial cavities, and the serous membranes of the chest and abdomen, is developed from the serous layer of the early ovum; and these membranes also, like the amnion, have in the fœtal state a tendency to excessive secretion, leading to congenital hydrocephalus and ascites. We may perhaps find an explanation of the sympathies between the skin and the serous membranes, as in the production of peritonitis or pleuritis by the influence of cold upon the skin, in their common origin from the serous or cutaneous layer of the ovum. The amnion is a reflexion from that part of the layer which forms the skin, and at birth the skin and amnion are continuous at the umbilicus, the amnion being reflected on the umbilical cord so as to form its external covering. The subject of the evolution of the perfect individual from a triple membranous sac would admit of an extensive development in human physiology and pathology. Man in his greatest pride does but consist of the multitudinous involutions and devolutions of these delicate membranes. Upon the vital energy possessed by these primordial layers depends his health, his tendencies to the diseases of the several systems evolved from them, and the duration of his existence.

The mucous layer has been described as the most internal of the membranous layers within the vitellary membrane. It is therefore in immediate contact with the central portion of the yolk, or that part of the mulberry mass not consumed in the formation of the three primary layers themselves. The first beginning of the mucous canals is formed by a constriction of the mucous layer on the under surface of the commencing fœtus. The constriction is formed by two processes of the mucous layer, which gradually approach each other. This constriction increases, until the smaller mucous cavity, from which the mucous membranes and glands are developed by a process of reduplication, is nearly cut off from the larger mucous cavity, which contains the remains of the germ-cells. This larger cavity it is which constitutes the Umbilical Vesicle, and the point of division between the two cavities subsequently becomes the umbilicus. It is from the umbilical vesicle that the embryo at this early period derives the greater part of its nutriment. At this time, the umbilical vesicle is continuous with the abdominal mucous cavity, by means of the vitelline duct at the umbilicus, the material of the yolk being conveyed to the embryo, not only by the duct, but by means of vessels developed in the part of the mucous layer composing the walls of the umbilical vesicle, and which vessels are called the vasa omphalo-meseraica. The omphalo-meseraic vessels consist of an artery and vein, which extend from the umbilical vesicle to the superior mesenteric artery and vein, in which they terminate. This state of things continues until the whole of the residuary material of the yolk has been converted to the uses of the embryo, when the umbilical vesicle, with the omphalo-mesenteric vessels, shrink

up, and their remains constitute the Vesicula Alba, the white **spot frequently seen, with** great distinctness, in the abortion **of early ova. (Fig. 35.)**

Fig. 35.



1. The chorion. 2. Yolk mass and commencing umbilical vesicle. 3. Embryo. 4, 5, 6. Folds of serous layer forming amnion. 7. Commencement of allantois.

The Allantois is another temporary structure, which, with its mode of origin, it is necessary to describe. It is formed at **the lower and anterior part of the embryo, not apparently from any reduplication** of either of the primary **layers, but from a mass of cells,** in the same **way as the heart and bloodvessels are formed. The cellular cavity is at first elongated in shape, but** by the usual process **of constriction it becomes divided into two, a larger and a smaller portion, communicating** with each other, and of which the smaller is the **urinary bladder.** The urachus—the cord leading from the bladder to the umbilicus—is the remains of the duct which originally connected the bladder and the allantois. The allantois is partly intended as an excrementitious organ, receiving the earliest secretion of the kidneys, but chiefly, in the mammiferous ovum, as a means of conveying a loop of the bloodvessels of the embryo to the maternal surface of the ovum, and thus providing the permanent fœtal provisions for nutrition and excrementation. This will be again adverted to, when describing the maternal portions of the membranes of the ovum.

CHAPTER VII.

THE DECIDUA, CHORION, PLACENTA, AND UMBILICAL CORD.

While the changes which have been described in the previous chapter as the results of fecundation are proceeding in the embryo, other phenomena, equally necessary to the development of the ovum, are occurring in the uterus. The formation of the Amnion on the part of the embryo has been already referred to, and there remain for consideration two other membranes, the Decidua and Chorion, both of which are formed on the side of the mother; and also the Placentà, which is developed from the bloodvessels of the fœtus, and from certain portions of the chorion and decidua. The clearest information respecting these structures will probably be conveyed by some account of the mode in which they are developed.

On the occurrence of impregnation, a remarkable stimulus is imparted to the uterus, before the ovum has entered this organ, and certain changes are produced which fit it for the reception and retention of the embryo. The Membrana Decidua, so called from its destruction at the time of parturition, is entirely the production of the uterus, and has been the subject of many discussions since the time of its first accurate description by William Hunter. In the early part of pregnancy, the decidua consists of two principal portions, the Decidua Vera, lining the cavity of the uterus, and the Decidua Reflexa, which immediately surrounds the embryo. At this time, owing to the small size of the ovum, as compared with the cavity of the uterus, these two portions are in contact only at the point where the ovum rests upon the uterus, this being generally at the upper part of the cavity of the fundus, near the opening of one of the Fallopian tubes. Up to a comparatively recent period, the opinion which chiefly prevailed respecting the formation of the decidua was, that, immediately after fecundation, the uterus developed upon its internal surface a membranous sac, constituting the decidua vera, and that the ovum, descending the Fallopian tube, entered the uterus by pushing before it a reflexion of this new membrane. It was supposed that the fold originating in this way enveloped the embryo, and constituted the decidua reflexa. The ovum thus appeared to become involved in a duplicate membrane, which has often been compared to the double envelope of the heart formed by the reflexion of the pericardium. Dr. Sharpey was the first to call into question the common belief respecting the nature and formation of the decidua, and his investigations led him to the conclusion that the decidua vera was not a membrane formed upon the uterine mucous surface, but that it consisted of the actual mucous membrane of the uterus itself, altered by a process of development, under the stimulus of impregnation. Dr. Sharpey was followed by Prof. E. H. Weber and others, whose researches have all tended to confirm this view, and we now possess a large body of facts, which appear satisfactorily to explain the origin of the decidua vera and reflexa, and the relation of the decidua to the chorion and to the formation of the placenta.

The earliest changes which occur in the cavity of the uterus, after the impregnation of the ovule, consist of a swelling of the tubular glands of the mucous membrane, and of the capillary vessels distributed in the interspaces between these glands. (Fig. 36.) In the uterus examined a short time after the occurrence of fecundation, the glands are distinctly visible to the naked eye. Their length at this time is from one and a half to two Paris lines. The tubes become lined with epithelium of a whitish colour, and a profuse secretion of celloid particles and albuminous matter takes place from the surface of the mucous membrane in the inter-follicular spaces. (Fig. 37.)

This cellular secretion is so profuse that it not only forms a layer upon the surface, but a considerable quantity is poured into the cavity of the uterus. The enlargement of the tubular glands already referred to, and of the capillaries of the interglandular spaces, together with the plastic secretion poured out upon them—in other words, the altered mucous membrane of the uterus—constitute the Decidua Vera. With respect to the mode in which the decidua reflexa is formed, the latest views are those of Prof. Goodsir and M. Coste. Mr. Goodsir, in his paper "On the Structure of the Human Placenta," published in 1845, explained the formation of the decidua in the following manner:—He considered the celloid matter secreted from the uterine follicles and the inter-follicular spaces to belong to what he terms the third order of secretions—that is, cells having the power of accomplishing further changes, and of developing other cells from their nuclei, after they have left the mucous membrane which originally pro-

FIG. 36.

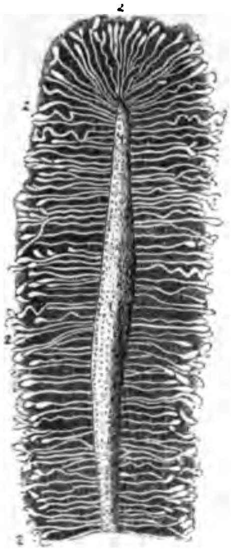


FIG. 37.

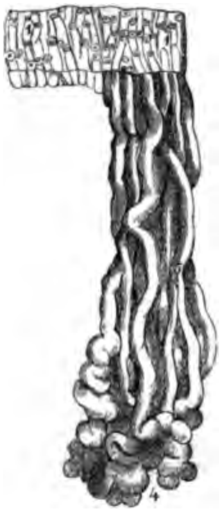


FIG. 36.—Section of the lining membrane of the uterus at the beginning of pregnancy, twice the natural size. 1. Opening of the glands on the surface of the cavity. 2. The utricular glands.

FIG. 37.—A portion of glandular structure, several times magnified. 1, 1. Orifices of the glands. 4. Cæcal extremities of glands. 5. Tubular portion of glands.

duced them. The minute ovum, on entering the uterus, becomes, according to Mr. Goodsir, imbedded in the cellular matter of the cavity of the uterus, which combines with its outer envelope the chorion, hereafter to be described, and ultimately forms the decidua reflexa. The decidua vera, then —in the opinion of Mr. Goodsir—consists of the uterine mucous membrane, altered in the manner described; while the decidua reflexa is a membranous, or plastic structure, formed out of the cellular secretion derived from the mucous surface, or decidua vera. According to the views of M. Coste, published two years later, the decidua vera, and decidua reflexa, are both produced directly by the metamorphosis of the mucous membrane of the uterus itself. He believes that the ovum, on entering the uterus, is imbedded in the soft and turgid mucous membrane, which becomes specially increased in thickness at the point which receives the ovum, and rising around it, like the florid granulations of an issue around a pea, ultimately meets, and is united, so as entirely to surround the ovum. (Figs. 38, 39.) This view of M. Coste was founded upon the dissection of two uteri at the twentieth and twenty-fifth days after fecundation. The difference between the opinions of M. Coste and Mr. Goodsir is, that the one considers the decidua reflexa to be formed directly from the decidua vera, while the other believes it to be produced indirectly from a plastic layer exuded upon the surface of the decidua vera.

FIG. 38.

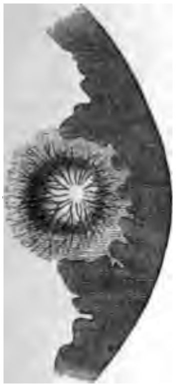


FIG. 39.

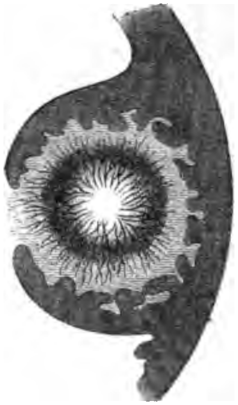


FIG. 38.—First stage of the formation of decidua reflexa.
FIG. 39.—More advanced stage of decidua reflexa.

When first formed, the decidua reflexa appears to differ from the decidua vera in being composed chiefly of cells, while the decidua vera is characterized by the presence of the tubular glands of the uterus. The portion of the cavity of the uterus—or, rather, of the cavity of the decidua—not occupied by the ovum, contains a fluid secretion, exuded from the hypertrophied mucous membrane, or decidua vera, of an albuminous character, which, in the early part of gestation, ministers to the nourishment of the ovum. This is the hydroperione of Breschet. Dr. Robert Lee believes that blood passes through minute openings in the decidua reflexa from the placental cells and the cells of the chorion, to be taken back into the maternal vascular system, through openings on the internal surface of the decidua vera, without being followed by the escape of blood externally. The internal surface of the decidua vera is smooth, but the external surface, or that in contact with the fibrous structure of the uterus, has been examined and described by Dr. Montgomery, who found it to consist of a number of cup-like elevations, or little bags, containing a whitish fluid, and which present open mouths on the side of the uterus. Dr. Montgomery terms these processes uterine cotyledons. They are best seen at the second or third months, and disappear with advancing pregnancy. Possibly these appearances may be the utricular glands of more recent observers. In cases of double uterus, in which only one is impregnated, a decidual membrane is sometimes found in the empty cavity; and it is generally, though not always, found in the uterus in cases of extra-uterine gestation. Considerable difference of opinion obtains as to whether the decidua lines the Fallopian tubes or not, but the weight of authority is against its doing so. The decidua vera increases with the development of the uterus, but after the adhesion of the ovum to the site of the future placenta, its chief development is at this part, and the Decidua Scrotina, as the portion of the decidua vera entering into the formation of the placenta is called, becomes the most important part of the decidual membranes. The rest of the decidua vera becomes a comparatively thin layer, lining the whole surface of the uterus, except at the cervix uteri and the angles at which the Fallopian tubes enter the cavity of the fundus. In the early months, the space between the decidua vera and decidua reflexa forms a cavity which has been already referred to, and which is called the decidual cavity. As the uterus is, up to a late period of pregnancy, considerably larger than the contained ovum, the cavity between the decidual membranes continues to exist beyond the middle of gestation. In cases of doubtful pregnancy, or where pregnancy has not been suspected, the uterine sound has been passed into the uterus nearly to the fundus without inducing labour or causing hæmorrhage. The instrument, of course, passes in these cases through the mucous plug of the os uteri into the decidual cavity without producing any laceration. I have known a case in which the walls of the uterus and abdomen were so thin that the limbs of the child could be felt with great distinctness, and extra-uterine pregnancy was suspected. One ground for this diagnosis was that the sound had been repeatedly passed into the uterus without causing mischief. Of course, it would be wrong, in any case in which intra-uterine pregnancy was suspected, to pass an instrument into the decidual cavity, as there would be great risk of detaching the placenta. The external surface of the decidua reflexa and the internal surface of the decidua vera gradually become so smooth that they have been compared to serous membranes. In the latter months, the ovum entirely fills the uterus, so that the whole aspect of the decidual surfaces is brought into contact, and it is often difficult to divide the two, in the attempt to induce premature labour by separating the membranes from the cervix uteri. At the time of parturition, the amnion, chorion, and decidua reflexa are expelled with the placenta; but the decidua vera is subsequently broken down, and escapes, in the form of detritus, with the lochial discharge.

The other envelope which the fœtus derives from the mother, is the Chorion, which is internal to the decidua, and is formed before the ovum enters the uterus. When the ovule escapes from the ovisac, it is surrounded by part of the granular matter forming the proligerous disc. After fecundation, and as the ovum is passing down the Fallopian tubes, it acquires, according to Valentin, Mr. Wharton Jones, and other observers, an albuminous layer, which becomes adherent to the vitellary membrane, or the outer covering proper to the ovule. The albuminous layer thus formed, constituting the commencement of the chorion, is considered by many authorities to be the analogue of the white of the egg, which is formed round the yolk in the egg of the bird during its passage through the oviduct. It is uncertain whether the chorion is formed in whole or in part, before or after, the act of fecundation. It is probable, however, that in the case of ova which never become impregnated, the vitellary membrane becomes coated with a layer of albumen. The chorion is also found in cases of extra-uterine gestation, when the ovum becomes attached to the intestines or the ovarium. Mr. Goodsir is of opinion that the decidua reflexa also contributes, with the chorion, to form the counterpart of the white of the egg. In the first instance, the albuminous chorion is itself a supply of nutritive material for the ovum; but it soon becomes converted into an absorbent organ, and obtains nutriment from the decidua and the decidual cavity. When first formed, the external surface of the chorion is smooth; but in the earliest state at which this membrane has been seen in the uterus, it has been found covered with villi, which present a shaggy appearance, and are devoted to the absorption and assimilation of material for the support of the embryo. Each chorionic villus is bulbous in shape, and consists of an external membrane, including, within it, a number of cells, which are the principal agents in effecting absorption. At first these villi present no bloodvessels, but draw nutriment from the elements with which they are in contact by endosmosis, like the spongioles of a plant. Afterwards, when the allantois, with the umbilical artery and vein, have approached the chorion, the villi contain vessels, which become largely concerned in the nutrition and growth of the fœtus. In the second month, the villi of the chorion are of considerable size, and their cellular cavities communicate freely with each other over the whole surface of the chorion. After the end of the second month, they diminish in size, except at the site of the placenta, the diminution proceeding from below upwards, until the whole of the unattached surface of the decidua reflexa and chorion become smooth. By the end of the fourth month, the villi of the chorion on the side opposite to the placenta have quite disappeared. Dr. Robert Barnes suggests that these villi disappear by a process of fatty degeneration. Dr. Robert Lee believes that before the fifth month the cells of the chorion contain blood, which is poured into them from the cavernous structure of the placenta. The villi of the chorion do not become developed into the villi of the placenta, hereafter to be described, but form the most internal portion of these villi.

With respect to the formation of the Placenta, it will be remembered, that in the preceding chapter the Allantois has been described as arising from the caudal extremity of the fœtus, and conveying the bloodvessels, constituting the future umbilical vein and arteries, towards the surface of the ovum.

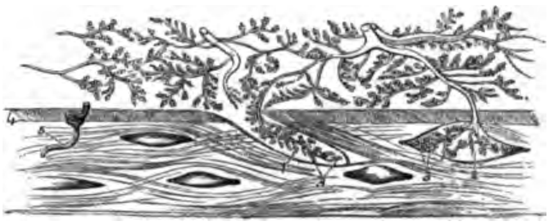
At the same time that this occurs, the decidua vera and decidua reflexa are acquiring considerable thickness at the point towards which the allantois is bearing the vessels, and a corresponding development of the villi of the chorion occurs in the same situation. From these elements the future placenta is developed. In obedience to the wonderful formative force which presides over all the operations of the embryo, the thickening of the decidua vera, and chorion, occurs upon the same aspect of the ovum, and towards this locality the allantois also directs itself, conveying thither the umbilical vessels. This occurs with almost unerring regularity, and in the fully-formed placenta the umbilical cord is generally implanted in or near the middle of the placentary mass. Sometimes, however, the umbilical vessels are inserted towards the edge of the placenta, and rare instances are met with in which the allantois projects the vessels towards the wrong part of the chorion, when the ovum perishes from a dislocation, so to speak, between the umbilical, chorionic, and decidual portions of the placenta. It is to Mr. Goodsir that we are indebted for the latest and best account of the arrangement of the chorion, decidua, and maternal and fœtal vessels in the placenta, and in describing them I shall chiefly follow that able anatomist.

If the uterine arteries and veins are examined in the gravid uterus while in connexion with the placenta, it is found that the uterine arteries pass from the walls of the uterus into, and through, the thickened decidua serotina. While passing through the decidual layer, the arteries make one or two serpentine twists, and hence are called the curling arteries of the uterus. They convey the maternal blood into large cellular chambers, which, as described by William Hunter, communicate with each other throughout the whole of the middle portion of the placenta. The blood is returned from this—which Dr. Robert Lee has called the cavernous structure of the placenta—by the uterine veins, which, as they enter the uterine walls, are dilated into sinuses of considerable size. These vascular cells, situated between the uterine arteries and veins, form in the aggregate an extensive placental cavity, or cavernous arrangement. Such is the entire circuit of the maternal portion of the blood in the placenta. The arteries, cellular chambers, veins, and sinuses, are lined throughout with a membrane continuous with the lining membrane of the vascular system of the mother. The large placental cells which have been spoken of as receiving the arterial blood from the uterus, and returning it by the veins, may be said to stand in the place of the capillaries in other parts of the body. The placenta itself is nourished by special capillary vessels, which enter it from the uterus. In immediate contact with the uterine surface, cellular bands are found crossing the sinuses, and threads of a similar character cross the cells or cavities of the placenta, and are attached to the placental villi, hereafter to be described. These bands and threads, which consist of files of cells, similar with the cells exuded from the surface of the decidua at the commencement of gestation, will also have to be reverted to presently. The whole of the placental vascular apparatus, on the side of the mother, may be said to be developed in the hypertrophied and metamorphosed mucous membrane, or decidua; and, in fact, this vascular apparatus and the decidua form together the whole of the maternal portion of the placenta.

The fœtal half of the placenta is found to consist of tufts, arranged in an arborescent form; of villi, which are attached to the branches of these tufts; and of the ramifications of the umbilical arteries and veins. The vessels of the tufts consist of a branch of the umbilical artery, and of a radicle of the umbilical vein. The fœtal blood enters by the arterial channel, and passes out by the veins; but between each branch of the artery and vein there runs, not an ordinary capillary, but a capillary vessel of large diameter, capable of carrying five or six blood globules abreast of each other. These peculiar vessels enter the villi, sometimes dividing and uniting again in the substance of the villi; at other times, one vessel passes into a single villus, or into two or three villi, and returns to the vein without dividing. These large capillaries present, in their course, dilatations and contractions, similar with those found in an intestine. The fœtal blood, coming to the placenta by the umbilical arteries, which carry the venous blood of the fœtus, passes through the intermediate vessels which have been described, and is returned by the umbilical veins after having undergone, in the placental tufts and villi, the changes necessary to fit it for the support of the fœtus; but there is no commingling of the streams of fœtal and maternal blood. The two sets of vessels are entirely separate, as was first demonstrated by William and John Hunter. As the uterine arteries and veins have developed themselves in the decidua, so the umbilical arteries and veins have ramified in the chorion and its villi, by a process similar with the formation of the first bloodvessels in the area vasculosa. (Fig. 40.)

Thus, to resume briefly, the placenta is formed by the fusion of the chorion and decidua, at the site of the attachment of the ovum to the uterus. The villi of the chorion, capped with a layer derived from the decidua, form the villi of the placenta. On the side of the mother, the vessels of the placenta consist of arteries and veins, with a series of cavernous cells between them. These cells, in the aggregate, form what has been termed the placental sac or cavity. On the side of the fœtus, the vessels consist of branches of the umbilical arteries and vein, with the large capillary vessels of the villi of the placenta between the two. The Maternal Portion of the placenta is formed by the decidua serotina, or developed mucous membrane of the uterus, the arteries and veins which enter the decidua from the uterus, the cavernous structure of the placenta, the blood circulating in these vessels, and the external layer of microscopic cells covering the placental villi. The Fœtal Portion of the placenta is formed of the chorion and its villi, the latter forming the internal portion of the placental villi, and of ramifications of the umbilical arteries and veins. In the process of the formation of the placenta, the chorion and decidua first become applied to each other. On the maternal side, at the site of the placenta, the uterine vascular system is developed in the way which has been already pointed out. On the fœtal side, the allantois projects the vessels which afterwards become the umbilical arteries and

Fig. 40.



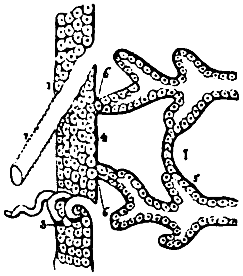
1. Substance of the uterus. 2. Cavity of a sinus. 3, 3. Fœtal tufts dipping into sinuses. 4. Decidual lining of the uterus. 5. Curling artery of the uterus.

vein to the chorion; and in the chorion a vascular system becomes developed in connexion with the umbilical vessels, which, taken together, constitute the fœtal portion of the vessels of the placenta.

To understand the intimate connexion with, and yet perfect separation from, the maternal and fœtal circulations in the placenta, and the mode in which the fœtus is nourished after the formation of the placenta, it will be necessary to describe a separate tuft of placental villi, or a single villus itself, the tuft being made up of an assemblage of villi.

Each Villus consists of its bloodvessel, a double series of cells, and its envelopes. The capillary is the central portion of the villus. Immediately around the vessel of the villus a layer of cells, derived from the chorion, is found. These cells are bounded by a fine membrane, which, in the early development of the embryo, constituted the external membrane of the villi of the chorion, but which, at a later period, forms the internal membrane of the placental villi. This part of the placental villi—that is, the internal layer of cells and the internal membrane—is, in fact, the remains of the original villi of the chorion.

Fig. 41.

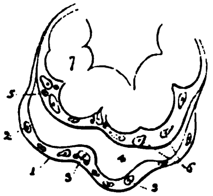


1. Decidua scrotina. 2. A venous sinus passing obliquely through it. 3. A curling artery passing through the decidua from the uterus. 4. Lining membrane of maternal vascular system. 5. Tuft of fœtal portion of placenta. 6, 7. Connexion of tufts with each other, and with the decidua scrotina.

On the outside of this inner membrane a cavity, or interspace, is met with, and, surrounding the space, there is a second layer of cells. The bands and threads found traversing the venous sinuses and the cavernous structure of the placenta have already been mentioned. Mr. Goodsir ascertained that these bands or threads are composed chiefly of cells, and are connected with the external cellular layer of the placental villi. He describes them as being, together with the external layer of cells belonging to the villi, the remains of the most internal portion of the decidua; and the external layer of cells represents, in his opinion, the remains of the secreting mucous membrane of the uterus, as it existed before the descent of the ovum through the Fallopian tube. Still more externally, each tuft of villi, or every single villus, is covered by the membrane lining the cavernous structure of the placenta, and which has been described as continuous with the lining membrane of the vascular system of the mother. Each tuft or villus projects into some part of the extended vascular cavity which exists between the uterine arteries and veins; and Dr. John Reid found that, in some instances, small tufts of villi entered the uterine sinuses, and could be drawn out from them without laceration.

Thus, each villus is composed of a bloodvessel, a layer of cells, and a fine membrane, derived from the chorion; of a second layer of cells, and a second membrane, derived from the decidua; with a small Cavity between the two; the whole of these structures being enclosed in the blood-membrane of the mother. (Fig. 42.) Thus formed, the villi lie in, and are bathed by, the maternal blood passing from the curling arteries of the uterus to the uterine sinuses, through the

FIG. 42.

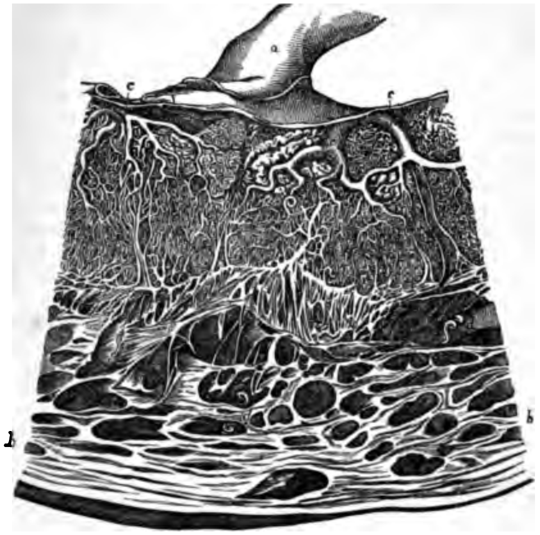


1. External membrane of placental villus. 2. External cells of villus. 3, 3. Germinal centres of external layers of cells. 4. Space between maternal and fœtal portions of villus. 5. Internal membrane of villus, or external membrane of chorion. 6. The internal cells of the villus, the cells of the chorion. 7. Loop of umbilical vessels.

great placental cells. Considering the placenta with reference to its lung function, the stream of maternal blood represents the atmospheric air, and the vessels of the villi take the place of the pulmonary capillaries. The blood is presented to the villi in the maternal channels in a perfectly arterial form, since there are no capillaries on the maternal side of the placenta, except those of the small nutrient vessels of the placenta itself, and the changes usually occurring in the passage of blood from the left to the right side of the heart are here effected by the capillaries of the villi and tufts, or the fœtal portions of the placenta. It may be said that the fœtal portion of the placenta is an apparatus for projecting a set of fœtal capillary vessels into a portion of the maternal circulation, which contains no capillaries, and where the capillaries of the villi become interposed between the maternal arteries and veins, in such a manner as, without any actual vascular continuity, to convert to the uses of the fœtus those changes which, in the systemic capillaries, are made subservient to the nutrition and renewal of the tissues of the different parts of the body. The capillaries of the fœtus become, in effect, in the placenta, a portion of the capillary system of the mother. In another sense, the fine blood membrane covering the villi, and the vessels of the villi, represent the lining membrane of the air vesicles and the pulmonary capillaries, and by the processes of endosmosis and exosmosis oxygen passes into, and carbonic acid and other excrementitious matters escape from, the fœtal circulation. Though the placenta is commonly spoken of as the lung of the fœtus, the changes effected in it, as far as the oxygenation of the blood is concerned, is more closely allied with the action of the gills of the fish, the blood of the mother representing the water passing through the branchiæ, but being more highly oxygenated. (Fig. 43.)

The pulmonic or branchial function is not the only one performed by the placenta in fœtal nutrition and excretion. The layers of cells derived from the decidua and chorion, and the vessels of the villi, are also analogous in function with the cells and lacteals of the villi of the intestinal tube. The external or maternal layer of cells is believed to grow continually by the assimilation of material from the blood of the mother. As these cells arrive at maturity, they burst, and their contents, which are of a milky appearance, are passed into the space or cavity between the two layers of cells, new generations of cells being formed to succeed them, from the germinal spots found in the villi. This cavity, repeated in the countless villi, constitutes the digestive apparatus of the placenta.

FIG. 43.



Section of fully-formed placenta, with part of the uterus. *a*. Umbilical cord. *b*, *b*. Section of uterus. *c*, *c*, *c*. Branches of the umbilical vessels. *d*, *d*. Curling arteries of the uterus.

The ruptured cells are constantly replaced by others, and, in microscopical examinations of the villi, cells of different sizes, from nuclei up to fully-formed cells, are constantly found. The chymous fluid, thus elaborated by the first layer of cells, and passed into the cavity between the two layers of cells, is next assimilated to a further and higher degree, by the internal and fœtal, or chorionic, layer of cells, as in the former case, by the growth and rupture of the cells, and the chylous material produced is absorbed and carried into the fœtal circulation by the vessels of the villi. The placenta may be said, therefore, to perform in the fœtus the functions of the lungs, and of the stomach and intestinal canal. In some of the lower animals the connexion between the parent and the ovum is much less complicated than has here been described. In the bitch, for instance, Dr. Sharpey has shown that the glands of the mucous membranes enlarge, and that into their cup-like cavities, processes of the chorion, or large single villi, are received and became adherent during gestation.

The human placenta is, at the full term, round or slightly oval in shape, its average diameter being from six to eight inches, and its circumference from eighteen to twenty-four inches; in thickness it varies from one inch to two inches, according as it may be full or empty of blood. The internal surface of the placenta is smooth, and covered by a layer of the amnion and chorion. Through these membranes the branches of the umbilical arteries and vein are seen ramifying and dividing in every direction towards the circumference of the placenta before they enter the substance of the organ. The umbilical cord is generally inserted into, or near, the middle of this aspect of the placenta; but sometimes it is attached near the edge, forming what is called battledore placenta. The external placentary surface—that, namely, in contact with the uterus—is covered with a thick layer of decidua,—the decidua scrotina. This surface is divided irregularly into a number of lobes, between which processes of the decidua slip down. When the placenta is expelled after labour, the divisions between these lobes are sometimes distinctly seen, owing to the laceration of the decidua which occurs on the separation and expulsion of the placenta from the uterus; but when gently peeled from the uterine surface, it is covered by an unbroken layer of the decidua scrotina, marked by the openings of the decidual arteries and veins. The openings of the arteries are circular, some of them being as large as a goose-quill; while the openings of the veins are oval, and of considerably larger size. At the end of the second month of pregnancy, the placenta occupies about one-half of the entire surface of the ovum. As gestation advances, the placenta increases in size—particularly in thickness—but the increase is not in the same ratio with that of the uterus or the other parts of the ovum. At the time of labour it extends over about one-fourth of the entire cavity of the uterus. It must be said, however, that the placenta varies very much in size. As the rule, children with whom there is a large healthy placenta are strong and well nourished, while the contrary obtains in the case of thin and small placentæ.

Large placentæ increase, however, the risk and danger of hæmorrhage after parturition, which rarely occurs when the placenta is considerably below the average size. It is doubtful whether the placenta possesses nerves or lymphatics. Its nervous matter, if any, is probably diffused throughout its structure, as in the case of the lower classes of animal life, in which nervous functions are performed without the existence of any special nervous system.

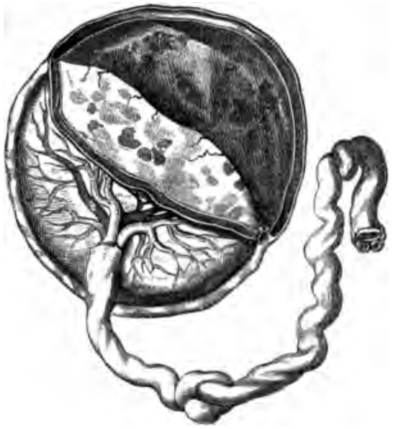
The placenta, at the full period, frequently bears upon its surface and structure evidences of its caducous character. This has been made known more especially by the able researches of Dr. Robert Barnes, followed by those of Dr. Druitt. The circumference of the placenta is often marked by a rim of yellowish material, consisting partly of fibrine and partly of fatty matter, and indicating the diminution of the area of the placenta in the latter months, probably by a process of fatty degeneration. The uterine surface of the organ is also frequently rough and gritty to the touch, from the deposit of earthy matter, chiefly carbonate and phosphate of lime. Patches of a lighter colour than the rest of the placenta are often seen upon its surface; these spots, consisting of fatty matter, and single villi and vessels in the interior, give unmistakeable evidence of commencing degeneration.

In the case of plural births, it generally happens that each child possesses its own involucra, and a separate placenta. Sometimes the placentæ are attached to different parts of the uterus, but most frequently the twin placentæ are side by side, the one apparently fused into the other to some extent, but without any vascular inosculation between them. In rare cases there is but one placenta, or the umbilical vessels of the twin or triplet children anastomose before their distribution to the placentæ; and cases have been met with in which there has been but one cord at the placental surface, and one placenta, the cord dividing to pass to the separate children.

The Umbilical Cord, or Funis, furnishes the channels of communication between the placenta and the fœtus. At the end of gestation, the cord varies very much in length. In some cases it does not exceed six or seven inches, while in others it has been known to measure five or even six feet. It contains the two umbilical arteries and the umbilical vein. The vein is much larger in diameter than the two arteries together, but the arteries are much longer than the vein. No doubt the blood, impelled by the fœtal heart, moves faster in the arteries than in the veins, so that the same quantity of blood passes through both. The vein in the umbilical cord and in its ramifications in the placenta is without valves, and conveys the purified blood and nutritive material from the placenta to the fœtus. The arteries convey the impure blood of the fœtus to the placenta. In these particulars the umbilical arteries and veins resemble the pulmonary vessels of the adult. Both arteries and vein are arranged in the cord in a spiral manner, the arteries being much more twisted than the vein, and coiling round it. The direction of the spiral turns made by the vessels is almost constantly from left to right. Sometimes a single or double knot is tied upon the cord, at others it is twisted once or twice round the neck, or it is coiled round the body and extremities, so as almost to resemble the Laocoon. The fœtal pulse is readily felt in the cord when the child is alive and before the funis has been separated. It occasionally happens that only one artery is met with instead of two, and cases have been observed in which the cord has contained two veins. The arteries do not communicate except by a branch near the surface of the placenta. Usually, the vessels divide on entering the placenta; but sometimes the division commences before they reach that organ, a circumstance which commonly diminishes the strength of the cord. (Fig. 44.)

The bulk of the funis is made up of gelatinous matter enclosed in cells which do not communicate freely with each other. The contents of these cells surround the vessels, and are a means of defence against pressure. The quantity of gelatinous material varies much in different embryos, and to this is chiefly due the thickness or thinness of the cord. The funis is also covered by a layer of chorion, and externally by a layer derived from the amnion. As in the case of the placenta, it is doubtful whether the cord contains lymphatics or nerves, or, at all events, if the nervous matter assumes a separate form. In this place a word may be said about the transmission of impressions from the mother to the fœtus. The absence of nerves in the placenta and funis would be no disproof of a communication between the nervous system of the fœtus and the mother. When the ovum consists of the blastodermic vesicle, and before the beginnings of the nervous system have been evolved in the course of development, it manifests properties which afterwards belong to the nervous system. In the unicellular animalcules, the same functions are performed which in higher animals, where the nervous system has assumed a separate type, are executed by the nerves. In these peculiar organisms, the nervous system, though not collected into tubes, or surrounded by neurilemma, pervades the whole animal. This may be the case with the umbilical cord and the placenta, or further researches may demonstrate the existence of nerves in these temporary structures.

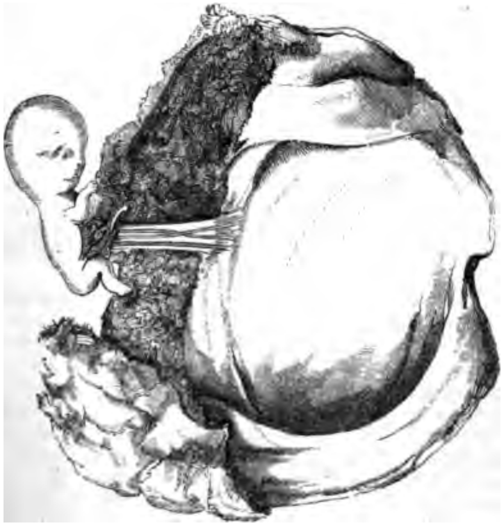
Fig. 44.



The umbilical cord and external surface of the placenta. The amnion and chorion raised from one portion of the placenta.

No satisfactory explanation has hitherto been given of the spiral arrangement of the vessels of the cord. When the cord is first formed, the vessels take a straight direction from the fœtus to the decidua, and the arteries and vein are not close together. After a time they become coiled round each other, and the cord diminishes in size, but increases in length. This increase is greater in the early and middle months of pregnancy than subsequently, so that at the middle of gestation the relative length of the cord is greater than it is at the time of parturition. The same remark may be made respecting the quantity of the liquor amnii. When the cord is long, and the amount of liquor amnii considerable, it is easy to conceive that the fœtus may, by its own movements, or the changing positions of the mother, pass through a loop in the cord, and thus form a knot. There is indeed no other mode whatever in which a knot could be formed. In the same way the passing of the cord round the neck or body has been explained. It appears to me that this explanation may be extended to the curious spiral arrangement of the vessels, and of the whole cord. The cord is originally straight, and can only have been twisted by the movements of the fœtus, the placenta being a fixed point. It would seem that the fœtus, when it moves, always tends to move in a certain direction, and that the number of spiral turns in the cord must represent the number of times which the fœtus has slowly rotated in the uterus during the course of gestation. In no other way can we explain the alteration of the vessels from the straight to the spiral form. I shall have to revert to this subject when treating of the movements of the fœtus *in utero*.

FIG. 45.



Early ovum in the Museum of Guy's Hospital, showing the straight direction of the vessels of the cord.

CHAPTER VIII.

SIGNS OF PREGNANCY.

The changes induced in the female economy by pregnancy are very various and extended. From the initial steps in the act of reproduction to its final close, a great number of phenomena occur in different and remote organs. The evidences manifested in the generative system are, no doubt, the most important; but the vascular system and its contained fluid, the different portions of the nervous system, the digestive apparatus, the skin, and the glands and their secretions, all contribute to the sum of those organic and functional conditions which we group together as the "Signs of Pregnancy." The difficulties attending the diagnosis in particular cases are manifold. We are frequently asked for a positive opinion at an early period of gestation, when the signs are not pronounced with distinctness. The symptoms vary in different women, or in the same women at different times. Some of the more obvious signs may be wanting altogether, or they may be simulated by disease. Difficulties often arise from the mental condition of the patient. We have at one time to deal with women extremely desirous of having children, or, again, with women who hold pregnancy in horror. In another class of cases our dictum is required when the most violent protestations of chastity are made. Under these various circumstances, women magnify certain symptoms, and suppress others, as far as possible, in accordance with their own wishes, or in order to deceive the attendant. We should, to use a legal phrase, "dismiss from our minds," in any case of doubtful pregnancy coming before us, all considerations except those of a physical character. Gooch expressed this when he said, with more force than elegance, that not "women's words, but their bellies" should be believed in suspected cases.

It is of importance, not only that accoucheurs, but all medical men, should pay attention to the signs of pregnancy; otherwise the practitioner may be confounded by the birth of a child, when no increase of the population had been expected; abortion may be produced unwittingly by emmenagogues or treatments applied to the examinations; or, under the false impression that pregnancy exists, serious disease may remain for months untreated and unchecked. In all cases which admit of doubt, the medical attendant will do well to suspend any positive judgment until the evidence one way or the other becomes certain, and in the meantime to be cautious in all that relates to the treatment and management of the patient.

The most convenient method of relating all that pertains to the signs of pregnancy is to consider them very nearly in the order in which they arise, by which means a double advantage will be gained: the symptoms of commencing and advanced utero-gestation will be grouped separately, and a method of examination will be fixed upon the mind.

The first indications of pregnancy are to be found in the reproductive organs. No sooner has a fruitful congress taken place than a change in the condition of the Uterus occurs—from a state of comparative quiescence, in which, apart from menstruation, the decay and repair common to all other tissues is its only function, it emerges into energetic activity, constructs a nidus for the reception of the expected ovum, and commences those intimate changes which result in the transformation of a fibroid mass into a muscle of immense energy. The greater the functional activity of an organ, the greater the amount of blood which passes through it in a given time. The uterus is no exception to this general law, and hence, when an examination is made per vaginam but a few days after conception, the uterus is found hot, turgid, and almost erect, as if endowed with the properties of erectile tissue. This state of the organ is by no means persistent; before any great length of time it gives way to softness and increased bulk; the uterine vessels increase in size from day to day; small twigs of artery become developed into vessels of considerable calibre; there are capillaries where none apparently existed before; the cellular tissue of the organ is in a manner unravelled by the dilated and dilating vessels, as well as by certain histological changes, and the parenchyma is moistened by interstitially-effused serum. The body of the impregnated uterus is, in all ordinary cases, slightly anteverted during early pregnancy, and the enlarged body of the organ may be felt by the experienced finger in the anterior vaginal cul-de-sac. A soft and cushiony state of the os uteri, with the detection of the dense body of the uterus between the anterior lip and the pubes, are amongst the earliest signs which lead us to believe in pregnancy. The unimpregnated uterus may be anteverted, but this condition is not attended by a soft condition of the os uteri.

Examined with the speculum, the os and cervix uteri are somewhat increased in size, the tissues appear less dense than in the impregnated state, and the white plug of mucus is distinctly visible in the lower parts of the cervical canal. Owing to the permanent condition of the plug during gestation, and the increased acidity of the vaginal secretion, the mucous plug is more firmly coagulated, and is of a more intensely white colour than usual.

Suspension of the Catamenia is commonly the first symptom of pregnancy which arrests the attention of an intelligent female who has exposed herself to the possibility of impregnation, and is perhaps the one in which women most firmly rely, especially if any abdominal enlargement coincides with the absent function. Its value as evidence of utero-gestation is modified by the fact, that the suspension of the menses, although tolerably constant, is liable to many aberrations, and is indicative of other conditions than pregnancy. Menstruation, or at least a periodical sanguineous discharge, may continue through a part of or the whole term of utero-gestation. Cases in which it has appeared once after impregnation are recorded by Johnson, Puzos, Desormeaux, Dewees, Stein, Gardien, and others. Burton, Maunsell, Campbell, and others also mention cases in which it appeared three, four, and six times, and similar instances have fallen under my own observation. There is a case detailed in Heberden's "Commentaries," in which the function persisted during the whole term of pregnancy; and Deventer, Hosack, and Haller testified to the occasional appearance of the phenomena. Deventer and Baudelocque speak of females in whom the catamenia appeared only during pregnancy, and a still more remarkable abnormality has been witnessed in some women, who have performed this function for the first time subsequent to impregnation. The necessity of preserving the outward appearance of virtue has instigated women to feign themselves regular by smearing their persons and staining their linen periodically. Belloc mentions such an instance, and suggests that if the vulva be washed, and the discharge does not reappear after a short interval, the case should be suspected.

An exactly opposed series of cases to those we have been considering is constituted by instances in which the catamenia are suspended, and pregnancy does not exist. Cold, shocks of any kind, exhausting discharges, incipient phthisis, the worst forms of ovarian disease, and several other circumstances, frequently suppress this function. Women who are nursing, as a general rule, do not menstruate, and, as the catamenial climacteric approaches, intermissions, even of several months, are frequent. There are cases again in which the history of the menstrual function is of no use whatever in determining the question of pregnancy. Some women prove pregnant before menstruation has ever occurred; some after it has apparently ceased altogether; and others at a time when the function has been suspended for several periods by known causes, such as lactation. The best rule, perhaps, for applying the catamenial test to cases of suspected pregnancy is, that if the suspension has persisted for several months, if, at the same time, the health has not suffered, and if the person is not giving suck, the probability that she is pregnant has reached the highest point to which it can be brought by evidence from this source alone.

Various derangements of the Digestive Organs usher in pregnancy. The exact period at which they occur is various and uncertain. In some women, nausea follows close upon the heels of conception; in others, no gastric sympathies appear until two or three months have elapsed; but from the second to the fifth or sixth week is the general period at which they are established. They usually decline about the fourth month; but their disappearance is liable to the same uncertainty as their invasion. Nausea, vomiting, eructations, heartburn, a peculiar sense of sinking at the epigastrium, cravings for peculiar or particular articles of diet, and antipathies to other comestibles, are the ordinary manifestations of gastro-uterine irritation observed. In general, the nausea, vomiting, and sinking occur upon first rising or assuming the erect posture, and persist only for a short time. The comparatively universality of this rule has caused these symptoms to be expressed by the term "morning sickness," a phrase which has become almost vernacular. It is obvious that the causes of gastric derangement, similar with those alluded to, must be numerous; and hence, except as corroborative proof, we can throw little light upon the diagnosis of a case of doubtful pregnancy by discovering that sickness has occurred in the morning, or that an affection has been shown for chalk, slate pencil, or some previously abhorred article of diet. The value of this, as of several other signs of pregnancy, rests upon its coincidence with other recognised signs. The synergic action between the stomach and the uterus, both as regards secretion, sensation, and motor action, are amongst the most remarkable phenomena of reflex nervous action. In the case of the gastric irritation of pregnancy, it is worthy of remark, that it is during the early months that the affection is most common and constant. It is probably caused by the distension and evolution of the dense structure of the uterus after impregnation, or by the pelvic irritation caused by the gravid uterus before it emerges from the brim, or from both these causes.

Certain Glandular Sympathies are excited during pregnancy, of which one of the most remarkable results is Salivation. This form of salivation is, of course, quite distinct from mercurial or other metallic affections of the salivary glands, differing in the absence of fœtid breath, of sore gums, or the prostration observed in such cases. It is probable that the watery vomitings of pregnant women partly depend on increased pancreatic secretion—a supposition which is favoured by the analogy between the structure and secretion of the pancreas and the salivary glands and the frequent excitation of the latter during pregnancy. Cases illustrating utero-gestative salivation are mentioned by Dewees, Van Swieten, Dr. Blundell, and others. In a slighter degree, such cases are not uncommon.

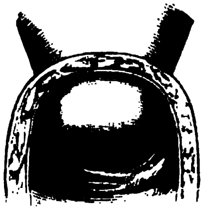
When pregnancy is but a few weeks advanced, the Mammæ begin to take on certain new actions, preparatory to their perfection as secretors of a nutritive fluid. The changes which take place in the breasts at puberty may be called the primary evolution of the mammæ. This is parallel to, and synchronous with, that evolution of the uterus and ovaries which produces the capacity to conceive; and the changes which take place in the mammæ after conception constitute their secondary evolution, and are parallel to, and synchronous with, those uterine changes, which give the capacity to nourish. The first indications of pregnancy given by the mammæ consist of a certain sense of fulness and weight, with shooting pains, these latter being sometimes confined to the gland itself, but at other times extending to the mamilla, where they may be almost constant, producing what is technically called "mastodynia." The afflux of blood to the breast which now takes place speedily replaces the mere sense of fulness by actual increase of volume; the gland becomes hard, knotty, and tender to the touch, and large blue veins may be seen meandering over its surface, just below the integument. A very cursory examination will suffice to distinguish this condition from the mere increment in bulk attained by persons who are growing corpulent. A deposit of fat does not give the same knotty feel to the breasts; the vascular supply is not sensibly altered, and a great volume may be acquired without any of those peculiar white, shining streaks appearing on the surface of the integument, which are the result of distension by growth of the gland. The most probable embarrassment is likely to occur in women who, having previously borne children, and having reached the threshold of the sexual climacteric, have their menses temporarily suspended, their breasts painful, and their stomachs irritable. Almost any uterine irritation will produce enlargement of the breasts and sympathetic mammary pains. Retention of the menses from an imperforate hymen, fibrous tumours of the uterus, and ulceration of the os and cervix uteri, are frequently concerned in these mammary changes; and habitual and excessive copulation sometimes has the same effect. These possible causes will, however, be remembered and sought for where any doubt exists. The most characteristic changes are to be found in the nipples and the surrounding areolæ. The nipples become turgid and more prominent, and the discs around them assume a darker hue, more marked in persons of a dark than of a light complexion. Ingleby observes that the cuticle of the areola becomes scaly, and that the general surface of the breast presents a mottled appearance. As pregnancy advances, especially if it be a first pregnancy, the deposit of pigment in the areolæ increases, the areolæ themselves become moister, and the follicles studding their surface are prominent, distended, and bedewed with transuded fluid. In women with dark hair and eyes, the outer part of the circle surrounding the mamilla presents an appearance of small white patches, as if the colour had been discharged by a shower of rain. Dr. Montgomery trusts more to the appearance of the follicles, the moisture on the areolæ, and the turgescence of the parts, than to the deposit of pigment, which results occasionally from uterine irritation, and not unfrequently is persistent after the first pregnancy. The mamillæ are sometimes so effectually compressed by tight corsets as never to rise above the level of the mammary surface until artificially drawn out. About the sixth or seventh month numerous white, silvery streaks make their appearance on the surface of the breast; they are exactly similar to those found on the abdomen, and are called lineæ albicantes. They are in reality the exposed floors of furrows which naturally exist in the skin, and they are unfolded in consequence of the distension of the subjacent gland. Once formed, they do not entirely disappear, and are therefore of little value as a sign of pregnancy, except in primiparous women. In common with the altered nervous and vascular condition of the mammæ, their secretive endowments are called into play at a variable period, ranging from the fourth or fifth month to immediately before labour. It may be said, as a general rule, that no secretion of milk takes place until eight-and-forty hours after labour; and, on the other hand, there are so many irregularities regarding the secretion of milk, that neither its absence nor presence can be rated at any considerable value, as proof or disproof of utero-gestation. Suppression of the milk in persons who are nursing and liable to impregnation, is a more valuable sign of pregnancy than the converse condition. Lastly, it must be remembered that recent abortion and lactation produce the same conditions of the mammæ as obtain in pregnancy.

The Size and Form of the Abdomen next arrest our attention in relation to pregnancy. During the first two months, no enlargement is visible, or if visible, can be trusted, as flatulent distension, and other evanescent conditions of the abdominal contents, produce variations in dimension beyond the possible limits of any size that may be attained at such an early period. At first, indeed, the belly becomes flatter, and the navel is deeper, as if dragged down by the increased weight of the uterus; there is a French proverb, "en ventre plât, enfant il y a," and in this, as in many other instances, popular belief coincides with scientific observation. The traction at the navel is said to be painful occasionally, and the navel itself tender to the touch. About the third month, abdominal enlargement becomes obvious in the nude figure, and from this period steadily increases until nearly the end of pregnancy. By the fifth month, the navel has become shallower, and the uterus may be distinguished through the abdominal walls; at the sixth month, it is flattened out; and in another month protrudes beyond the level of the general surface of the abdomen. Numerous other circumstances give rise to enlargement of the abdomen. Ovarian dropsy, ascites, certain diseases of the spleen and liver, flatus in the bowels, accumulated fæces, tumours of the omentum, and unusual deposition of fat in the omentum and abdominal walls, as well as hydrometra, physometra, fibroid and other tumours of the uterus, and intra-uterine polypi, all produce an increase in bulk, which may to a certain extent simulate pregnancy. It is necessary to observe, that some of these conditions may co-exist with pregnancy. A little care will, however, suffice to distinguish between the above-mentioned forms of enlarged abdomen, and an abdomen distended by the gravid uterus. Such a mistake as that quoted by Gooch from Lowder's MS. lectures, where a practitioner mistook pregnancy, with a distended bladder, for ovarian dropsy, and thrust a trocar through both sides of the bladder, and through the walls of the uterus, into the child's head, would be unpardonable at the present day. The history of the enlargement, its form, and the evidence procurable by means of auscultation, palpation, and percussion, ought to preclude the possibility of any grave error in practice. Inquiry will almost always elicit the fact, that in ovarian dropsy the enlargement has, at first, been on one side, and fluctuation is easily distinguished. In ascites, there is a previous history of disease, and the form of the abdomen, in the recumbent posture, is widely different from the ovoid belly of a pregnant woman; the contained fluid, in a case of ascites, from its obedience to the law of gravitation, produces a bulging between the crest of the ilium and the false ribs, the anterior and middle aspect of the abdomen being its flattest part. Enlargement of the liver and spleen increases from above downwards, and tympanitis is extremely easy of detection. The only real embarrassment arises from those cases in which the uterus itself is distended, and then other symptoms must be referred to, in order to determine the question. The elastic nature of the uterine tumour is simulated by no other abdominal enlargement, and is so far valuable as evidence of pregnancy; but fluctuation may be obtained where the liquor amnii is very superabundant; or an ovarian cyst may intervene between the gravid uterus and the surface of the body, so that the absence of the peculiar impression conveyed by palpation is not so negative as the converse is positive. When a blighted fœtus is retained in utero, no further increase in size takes place; and this contingency must not be forgotten in forming an opinion as to the condition of a woman who has had progressive abdominal enlargement, with other signs of pregnancy up to a certain date, followed by recession of her uterine sympathies, &c., and arrest of increase in bulk. Silvery streaks appear on the surface of the abdomen when it becomes much distended; once formed, they are permanent, but they do not by any means occur in all cases. They are only of use as a sign of pregnancy in first cases, or where long intervals have passed between successive pregnancies. Dr. Cormack has drawn attention to the dark line which occurs during pregnancy in the median line of the abdomen. It is constant in the latter part of gestation, but being the result of distension, it is present in the case of other abdominal tumours.

Reference has already been made to the condition of the uterus immediately after impregnation. During the first three months of pregnancy the lower part of the uterus feels soft and almost œdematous; the os, which had before been firm and with well-defined lips, becomes of a more rounded form, and the tip of the finger can be inserted between them. In first pregnancies such changes are more marked than in multipara, especially if the parts have been at all ruptured during labour. The whole body of the uterus sinks lower down in the pelvic cavity, and the os can be felt, not only lower down, but somewhat displaced towards the hollow of the sacrum; the fundus of the organ is anteverted to a corresponding extent, and it is partly to this circumstance, as well as to the intimate sympathy between the uterus and the other pelvic organs, that the frequent micturition and sense of weight in the rectum, which accompany early gestation, are attributable. Approaching menstruation, or the engorged condition of the womb, sometimes met with in menorrhagia, simulates these earlier changes of pregnancy to some extent. The body of the uterus can be distinguished more readily in the anterior vaginal cul de sac as pregnancy advances, and about the fourth month the fundus may occasionally be felt just above the pubis. With its gradual increase in bulk the womb has gradually risen to the pelvis. Many authors state that the uterus rises suddenly out of the basin of the pelvis into the general abdominal cavity. There is, however, no real proof that the uterus at once emerges from the pelvis, and there are many circumstances which render it extremely improbable. The idea of the sudden escape of the uterus from the pelvis involves a notion of some great and sudden increase in the contents of the cavity, or of the sudden removal of some impediment. In cases where there is much antero-posterior contraction of the brim, a malformation which involves less contraction of the cavity than most other distortions, permanent incarceration should result at or about the fourth month, if the uterus really remains entirely in the true pelvis until that period, and cases of extreme contraction of the brim or pelvis generally, should have a history of difficulty at the time of the supposed emancipation of the womb. No such histories are on record. The real state of the case appears to be, that the uterus rises slowly out of the pelvis, partly because its increase in bulk is from above, the fundus being the first part developed, and the cervix the last; partly because it is in reality a wedge with the apex below; partly because the bladder pushes the uterus upwards every time it is distended, directly, by means of the fluid contained in it, and indirectly, by elevating the vesical layer of the pelvic fascia, to which circumstances may be added the obliquity of the pelvis, and frequent changes of position on the part of the mother. About the fifth month the uterus is found to have risen half way to the umbilicus. It is now that the cervix uteri begins to shorten its cavity, being taken up into the general uterine cavity by a process of development commencing at the junction of the cervix with the body of the organ, and terminating at the os itself. The finger may be inserted between the lips of the mouth of the uterus with greater facility as each month passes, and the follicular glands of the cervix may be felt just within. At the same time the orifice of the womb moves upwards and backwards towards the sacral promontory, and by the time it has reached its most posterior and superior position, the cervix has completely disappeared, the os uteri being a mere rim. Externally, the uterus reaches as high as the umbilicus at the sixth month, half way between the umbilicus and the ensiform cartilage at the seventh, and as high as the latter structure at the eighth; after the eighth month the increase in size is more observable in the way of increased tension, and indeed shortly before labour sets in, an apparent diminution in size takes place. The head, a presenting part of the child, may now be felt through the os uteri. (Figs. 46—49.)

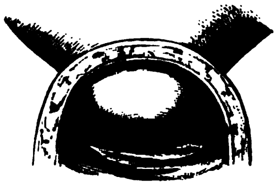
Quickening generally occurs when pregnancy is advanced about half way; Denman gave the sixteenth week as the period at which it most commonly occurs, and Dr. Fleetwood

FIG. 46.



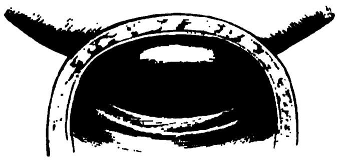
Os and cervix uteri at the third month of gestation.

FIG. 47.



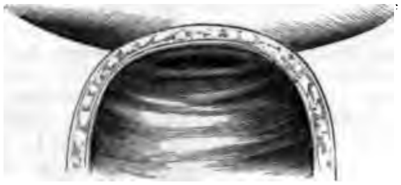
Os and cervix at the sixth month.

FIG. 48.



Os and cervix uteri at the eighth month.

FIG. 49.



Os and cervix at the full term.

Churchill gives nearly the same average; Dr. Ramsbotham places it between the sixteenth and eighteenth week; Puzos had known it to occur at the end of two months, and it has not unfrequently been postponed till the sixth, seventh, and eighth months; it is, in truth, very variable, and instances are met with in which it does not occur at all. By some authors it is believed that quickening is the first sensation by the mother of the movements of the fœtus; others have supposed it to be a sudden ascent of the uterus from the cavity of the pelvis. The nature of the sensation will be differently described by different women. The child of Elizabeth is said by St. Luke to have "leaped in her womb" when she heard the salutation of Mary; in some women it is described as a pulsation, and others speak of it as a fluttering or an occasional shock, attended by a sense of faintness, sickness, and sometimes a slight sanguineous discharge. The physical cause of the symptom is doubtless motion of the fœtus, and the period at which it occurs is most probably due to the increased size and activity of the child, which permit it to come into occasional contact with the walls of the uterus, through the liquor amnii. Accidental circumstances may perhaps give rise to the particular motions first perceived, and it may occasionally happen, that these accidental stimuli being wanting, no perceptible motion occurs. The value of the symptom as a sign of pregnancy depends partly upon whether the patient has experienced these sensations before, and partly upon the amount of credence to be attached to her statements and opinions. The motions of the fœtus having been once established, they may continue to be felt at intervals of variable duration by the mother or by another person. Dr. Montgomery thought he could determine the motions of the fœtus before the mother was conscious of them: it must, however, take a very prolonged examination to elicit any information at so early a date, and even then some doubts may be entertained as to whether the observation can be trusted. At a later period, it becomes very easy to perceive the movements of the living fœtus. As the points by which it comes into contact with the uterine walls gradually multiply, more trifling circumstances suffice to set up excito-motor actions; the mere pressure of the hand upon the abdomen will sometimes produce palpable kicks. It is not always easy to distinguish between the movements of the fœtus and some other movements which occur in the pregnant woman. The uterus and abdominal walls have special actions of their own. The uterus is subject to peristaltic contractions, which, starting from one end of the organ, traverse its whole extent like a wave. They may be discriminated from the fœtal kicks or plunges by the travelling ridge which they produce, and which may be felt under the hand. At other times, the uterus contracts at certain portions. These contractions shift from one place to another, and convey the impression to the mother that the child's head is moving about. It is the peristaltic actions of the uterus, and not the movements of the fœtus, which are produced when the hand is dipped in cold and acid water. The abdominal muscles are subject to involuntary contractions, arising from the irritation which the contact and pressure of the uterus produces, but it is voluntary contraction of the abdominal muscles which most usually simulates the motions of the child.

In the year 1818, a great advance was made in the diagnostics of pregnancy. Mayor, of Geneva, published a memoir in the "Bibliothèque Universelle," on the detection of pregnancy by the pulsations of the fœtal heart. This discovery attracted very little attention until four years afterwards, when Kergaradec published a systematic work on Auscultation as applied to pregnancy; he added a knowledge of the so-called bruit placentaire to M. Mayor's discovery. At a later period, Dr. Kennedy discovered the funicular pulsations, and Naëgele described what may be called "sounds of the displacement of the fœtus." Other sounds may be heard on applying the stethoscope to the abdomen of the pregnant woman: they are the products of muscular action. The value of these auscultatory phenomena is very different, but there are no other signs of pregnancy so unequivocal, or upon which we may so safely rely. The subject of utero-fœtal auscultation in this country has received its chief development from the writings of Dr. Kennedy, and the excellent translation of Naëgele's work on Auscultation by Dr. West.

The uterine souffle, bruit placentaire, or placental murmur, as it is called by different authors, is distinguishable before any of the other intra-uterine sounds. Great difference of opinion has existed as to the earliest period at which it may be heard; a similar variety of opinions has prevailed as to the exact seat of the murmur. Dr. Kennedy averred that he had heard it at the tenth week, while Velpeau states that the mere fact of its having been discovered even at the third month is sufficient proof that whatever the sound observed may have been, it could not have been produced by the utero-placental circulation. It may be said, as a general rule, that until the fourth or fifth month, that is, until the uterus has risen out of the pelvic cavity, the uterine souffle is inaudible; after that period it may generally be heard on any point of the region of the uterus which is accessible to the ear. The situation of the sound will vary as pregnancy advances; in the earlier part of the second moiety of utero-gestation, it is heard nearer the pubes, and it gradually ascends from week to week. It is seldom heard quite at the fundus uteri or in the lumbar regions. The character of the sound is very different in different persons, and varies in the same individual; sometimes it is a hoarse and sometimes a soft blowing murmur, at others it is a cooing sound, and, again, it is sibilant or musical. Now it is immediately beneath the ear, and again is distant. It is synchronous with the radial pulse. It is modified by the pressure of the stethoscope, and may disappear and recur again under the instrument. On some days, in the early part of its appearance, it is absent, and on others it is present. Whatever may be the exact physical cause of this sound, there can be little doubt now that it is produced in the walls of the uterus, and not, as Hohl supposed, in the placenta, or, as Kiwisch believed, in the epigastric, and others, in the iliac arteries. It may be well to state the foundations for this conclusion; the same sound has been heard in cases of fibrous tumour and vascular sarcoma of the uterus, and in moles; it is often heard over the whole surface of the uterus, accessible to the stethoscope; it persists for a short time after delivery; it has been heard in cases where putrid fœtuses have been born, and the placenta found with its vessels full of thickened and coagulated blood. These reasons appear to be conclusive against the placental theory, and others exist which eliminate the iliac arteries or aorta from the question. If the sound were produced by pressure on the iliac arteries or aorta, it should disappear when that pressure is removed by the assumption of the prone posture, whereas it persists in every position; pressure should intensify the sound if this hypothesis were correct: the contrary frequently obtains, and indeed the murmur not unfrequently disappears under pressure, even when it is made on the anterior aspect of the uterus directly towards the spine. And finally, the metroscope of M. Nauche, applied to the cervix uteri, in the vagina, transmits the sound when abdominal examination has failed to distinguish it. The sound is heard most distinctly at the usual site of the attachment of the placenta, and this circumstance appears to have misled Hohl and others; it is, however, only in accordance with the fact that the uterine vessels are largest where the placenta is attached. As a sign of pregnancy, the uterine souffle is extremely valuable; it can be distinguished from any possible arterial imitation by the absence of impulse, or by changing the position of the patient; and a very simple device will distinguish between it and the vesicular murmur, if the latter should happen to be audible lower than usual, for if the stethoscope be moved gradually upwards, any lung sound will of course become intensified, whereas the uterine souffle will diminish. The uterine souffle is no proof of the life of the fœtus, nor can it be made use of to determine the position of the child, or whether the uterus contains twins.

Widely different from the foregoing acoustic phenomena is the double pulsation discovered by Mayor. The ticking of a watch heard through a pillow has been aptly compared with the rapid pulsations of the fœtal heart, as heard through the uterus and abdominal walls. There is a distinct rhythm in these sounds, consisting, as in the perfectly developed individual, of two sounds of unequal length, followed by a pause. The number of pulsations varies, according to M. Jacquemier, from 108 to 160 per minute, but 130 will represent the average frequency of the embryonic pulse. It, however, subsides, to a certain extent, during the last month of pregnancy, a change which is continuous with that well-known declension in the frequency of the pulse which advances pari passu with increasing age. Dr. Hope gave 150 as the fœtal pulse at the fifth month, and 120 as that of the ninth month. The beating of the fœtal heart may generally be distinguished, for the first time, during some part of the fifth month. At first the sound is very feeble and distant, but by degrees it acquires strength and the diminution of the liquor amnii, by allowing the fœtu to come into contact with the uterine walls, facilitates th conduction of the sounds to the ear of the observer. Nothin can be more shifting and variable than the sounds of the fœt heart—now they may be heard on one side of the abdome and now on another; their position even changes during t same examination, and sometimes they suddenly cease, rather escape observation, for days together. A like chan in their intensity occurs, but frequent observation detec steady increase in their force. Occasionally, they are never heard during the whole of pregnancy, and the absence of these sounds is not conclusive of the death of the fœtus, unless they have undergone a gradual declension in intensity previous to their cessation, and even then it is perhaps safer to look for corroborative proof elsewhere before coming to a decision. They are accelerated temporarily by the motions of the fœtus. The area over which the sounds of the fœtal heart may be distinguished varies according to the force of the heart's action, the amount of liquor amnii, and the position of the child. There is only one possible circumstance which can at all imitate the sounds of the fœtal heart, and that is, when the sounds of the maternal heart, from emotional or other causes, are increased in frequency and force, and conducted through the diaphragm and liver to the uterus. In these cases, the pulse at the wrist and the supposed fœtal pulsation are synchronous. The same device which has been recommended for distinguishing between the vesicular murmur and the uterine soufflet will establish the differential diagnosis in this case.

Dr. E. Kennedy states that, "in some cases, where the parietes of the abdomen and uterus were extremely thin, he has been able to distinguish the funis by the touch externally, and has felt it rolling under his finger, and then applying the stethoscope, its pulsations have been discoverable, remarkably strong." Dr. Churchill and Naëgele support Dr. Kennedy against Haus and Hohl, who deny the fact. The observation, however, although it reflects much credit upon the acumen of Dr. Kennedy, can hardly be of practical use, because, where the abdominal and uterine walls are so thin as to permit us to feel the pulsation of the funis through them, the other auscultatory signs of pregnancy, and the evidence obtained by palpation, must already have set the question at rest; and except under such circumstances, it must be very difficult to discover the funicular soufflet. The sounds of the displacement of the fœtus consist of shocks—sometimes quick, like a light tap, and at other times more like a heavy plunge; and there are also friction sounds, which are evidently produced by the gliding of the surface of the fœtus over the inner uterine surface. Naëgele avers that these sounds may be heard before quickening has taken place.

Ballottement is a means of acquiring information as to the circumstances of pregnancy, first made use of in France.

There are two kinds of ballottement—the internal and the external—the first of which is practised by one or two fingers introduced into the vagina, and the latter by manipulations applied to the surface of the abdomen. "Ballotter" signifies "to toss a ball, as at tennis;" and the manœuvre in question is a kind of tossing-up of the fœtus in the waters of the amnios. The method of performing the internal ballottement is as follows:—The woman is placed in bed, with the trunk in a semi-recumbent position, so as to make the axis of the uterus coincide with a line passing perpendicularly from the fundus uteri to the ground, and to bring the uterus as low down into the pelvis as possible. The bladder and rectum should have been previously emptied. The first or two first fingers of one hand must now be introduced into the vagina, and applied to that part of the cervix uteri, or uterus, which is situated between the anterior lip of the os and the pubis. The other hand, or the hand of an assistant, should then exercise steady pressure on the abdomen; and a deep inspiration on the part of the patient will finally bring the uterus into the most favourable position for the experiment. Immediate advantage must be taken of the temporary cessation of breathing to make a rapid jerking push against the uterus with the tips of those fingers which are applied to it in the vagina. If there is a fœtus in the uterus, and if the proper period of pregnancy has been selected, a hard body will be felt to recede from the fingers as if rising in the intra-uterine fluid, and in a second or two it will fall again on the tips of the fingers. This is the internal ballottement. The period at which it is applicable is from the end of the fourth to the end of the sixth month, as a general rule; but it must vary according to circumstances, such as the bulk of the fœtus, the quantity of the liquor amnii, and the width of the pelvis. When once discovered, it is a tolerably conclusive proof of pregnancy. The external ballottement is best performed by placing the woman on her side, on the extreme edge of a bed, so as to have her abdomen projecting beyond it. One hand should then be applied to the undermost side of the belly, and another to the opposite surface, in order to steady the uterus. If a fœtus is present, a similar manœuvre may now be practised, as in the internal operation; a sudden impulse from the lower hand propelling the fœtus towards the upper part of the amnion sac, from whence it will gently descend again upon the same hand. If the fœtus is very small, no sensation will be imparted to the hand by its descent; and if the liquor amnii be scanty and insufficient to float the child, the experiment will entirely fail. Regarded as evidence of pregnancy, the external is very inferior to the internal ballottement. It is not applicable in so early a stage of pregnancy, a much larger bulk being necessarily obtained before the uterus is brought into sufficiently extensive contact with the abdominal parietes for such delicate manipulation. After the six months of utero-gestation, the quantity of liquor amnii becomes relatively decreased, and the fœtus is not so well floated, except in some few cases in which the fluid is preternaturally abundant. A kind of spurious ballottement may be sometimes found in cases of ovarian dropsy, where a pedunculated cyst floats within a larger cyst. The ballottement is no proof of the life of the fœtus. It should be mentioned, that great length of the cervix uteri, or a footling position of the fœtus, will make the internal process difficult, and sometimes impossible.

A substance called Kiestein, which occurs in the urine, is one of the minor signs of pregnancy. So far back as 1486, Savonarola gave an account of a urinary deposit which was evidently this material. He compared it to carded wool, but did not pursue its history beyond this point. MM. Nauche and Eguisier, in publishing their supposed original discovery of this matter, made use of Savonarola's simile, speaking of it as a cotton-like cloud; and they gave a further detail of the transformations it goes through, which are as follows:—The cotton-like cloud, in the course of from two to six days, becomes resolved into a number of minute opaque bodies, which rise to the surface, forming a fat-like scum. This persists for three or four days; the urine then becomes very turbid, and minute flocculi detach themselves from the crust and sink to the bottom of the vessel, until the whole pellicle disappears. This crust never becomes mouldy, and never lasts more than three or four days. The pellicle contains crystals of triple phosphate, fat, and a peculiar nitrogenous body allied to casein. It is supposed that during pregnancy, the mammæ secrete a certain quantity of abortive milk (if the expression may be allowed), which is again taken up into the circulation, and excreted by the kidneys. Analogous facts exist regarding other secretions. Casein has been found in the blood by MM. Grullot and Leblance during lactation, and thus an additional probability has been given to the truth of this hypothesis. When kiestein is present in the urine, it persists from the end of the first month to delivery. A minute investigation of the exact nature of the body, and the opinions of all writers on the subject, is unnecessary; but the following considerations will point out how far it is really valuable as affirmative or negative of pregnancy. It has been found in the urine of women not pregnant. It is found, for instance, in the urine of women taking cod-liver oil; and it is not always to be found in women who are with child.

There are a great variety of miscellaneous evidences of pregnancy, many of which are not constant enough to be of any great value, unless they have occurred in former pregnancies. Such are the different intellectual and moral peculiarities which affect certain women. The countenance also becomes much altered from absorption of fat; the eyes look somewhat sunken, and surrounded with a dark areola; the alæ of the nose are pinched; and the corners of the mouth dragged down, so that the mouth hence looks larger. The blood is said to be buffy; but Dr. Montgomery suggests that this may be because those women who have been bled whilst pregnant have been so bled on account of some inflammatory disease, and he altogether denies that any indications of pregnancy can be derived from the blood. Dr. Garrod has stated that the proportion of fibrin is not increased in the blood of pregnant women. Lecat mentions a woman whose face became black in three successive pregnancies, and Gardien relates other instances. Burns mentions discoloration of the skin as not infrequent, and some women always have cutaneous eruptions during utero-gestation; others have dark spots developed upon the face. Dr. Simpson mentions ephelis as an occasional concomitant of pregnancy. Intense pulsating occipital headache has been considered a sign of pregnancy by Dr. Beccaria, and hence called Beccaria's test. Pruritus is with some women a very constant indication of the commencement of pregnancy.

Jacquemin and Kluge called attention to a violet colour of the vagina and inner surface of the vulva, as an indication that the uterus was tenanted. Parent Duchatelet corroborates these statements, and says the colour is never absent in pregnancy. Pressure from any other cause, obstructing venous return from the parts, would have the same effect. Hepatic disease, or pelvic tumours, or obstructed respiration, may be attended by a similar discoloration. Osiander attached some importance to the vaginal pulse, which may be felt somewhat increased in volume and force as pregnancy advances. The vaginal artery, he says, can be felt pulsating more rapidly than the radial when abortion is threatening?

CHAPTER IX.

DISORDERS OF PREGNANCY.

THE special disorders of the pregnant state chiefly arise from reflex irritation of other organs by the uterus and its contents; from morbid conditions of the gravid uterus itself; from the effects of mechanical pressure and displacement; and from the influence of these causes, combined with the modifications of nutrition and excretion incidental to the development of the fœtus and the suspension of the catamenial function, upon the maternal vascular and nervous systems. In the production of many of the affections of pregnancy, all these causes more or less concur; and some of the prominent disorders are but the signs of pregnancy in an exaggerated form. Too much attention cannot be given by the student and practitioner to the diseases of the pregnant state, and to the prudent management of pregnancy. It is during gestation that the foundations are laid for some of the most dangerous affections of labour and the puerperal state. Pregnancy is the time for prophylactic measures, having reference to the safety of the mother and child in parturition. Conjunctures frequently occur, in which no amount of care and skill at the time of labour can make up for apparently trivial neglects during the course of gestation. This is the especial period when difficulties may be foreseen, and prevented or avoided. Nothing will contribute more to the reduction of the dangers and mortality of obstetric practice than a careful attention to the disorders of pregnancy.

Of the disorders depending upon reflex irritation, excessive Nausea and Vomiting are amongst the most troublesome to which the pregnant woman is liable. Sometimes the affection is bearable, the stomach returning certain kinds of food, or being irritable only at particular times of the day, especially in the morning. In other cases, it continues to such an extent that constant nausea distresses the patient, and vomiting invariably follows upon every attempt to take nourishment, whether in the liquid or solid form. The epigastrium becomes tender, and there is general fever, with great prostration and debility, as in idiopathic gastritis. An almost poisonous influence seems to be exerted by the gravid uterus in some constitutions. Such a state of things may go on for weeks or even months, and it is difficult to account for the continuance of life in some of these cases, except upon the supposition that a small quantity of food remains in the stomach after each vomiting. It occasionally happens that other circumstances besides the uterine irritation increase the tendency to vomiting: women, for instance, who have undertaken voyages during pregnancy, have died from the combined effects of sea-sickness and the vomiting of pregnancy. A friend of my own lost a sister from this kind of vomiting, during a voyage to Australia. I have known of two other similar instances, and such cases are not very uncommon. I have seen the gastric irritation much aggravated by the occurrence of hooping-cough during the gravid state. In the worst cases, women who are not relieved, or who do not abort, perish slowly from starvation, or they die from the rupture of a bloodvessel, convulsions, or exhaustion, after violent and continued fits of vomiting. The matters vomited from the stomach consist of the food and drink swallowed, an acid, glairy or watery mucus, secreted by the stomach and pancreas, and, when the sickness is excessive, of bile which has ascended into the stomach by an antiperistaltic action, or of blood from the rupture of vessels during the paroxysms of vomiting.

The first thing to be attended to, as regards treatment in the vomiting of pregnancy, is to attempt to get the secretions, particularly those of the stomach and bowels, in as healthy a state as possible. One of the most old-fashioned and serviceable remedies is the infusion of calumba with soda. The calumba and soda, with from three to five drop doses of the dilute hydrocyanic acid, three times a day, is a very useful combination. A grateful and sedative tonic is also made by giving citric acid with the calumba and soda, so as to form an effervescing draught. Cases are met with in which vomiting affords great relief, by getting rid of vicious gastric secretions, other means fail, and when exhaustion of the patient cannot be arrested, the last remedy is the emptying of the uterus, and this should never be delayed so long as to put the patient in a state of imminent peril. Nature herself often terminates the distress by spontaneous abortion. It has happened to me to have been twice consulted within a recent period in cases in which the induction of premature labour artificially was so long delayed, that the patient died before abortion could be induced. Paul Dubois has stated that he met with twenty fatal instances in thirteen years. It is a reproach to our Art that such cases should occur. The means of inducing abortion and premature labour will have to be discussed hereafter.

Anorexia, Indigestion, Heartburn, Gastralgia, and Variable Appetite, are caused in certain patients by the reflected irritation of the gravid uterus upon the stomach. Some women never feed so well as when they are pregnant, but in general, the appetite fails somewhat, and particular articles of food are regarded with aversion. A morbid desire for salted matters, acids, or alkalies, is not uncommon. Sometimes there is great loathing of every kind of food, or there is an extravagant desire to eat particular things, amounting to pica. These "longings," as they are termed, should be gratified as far as they reasonably can be. The common tendency of the appetite in pregnancy is to prefer fresh vegetables, fruits, and cooling drinks, and to avoid stimuli of all kinds. In this, the taste of pregnancy accords very well with its requirements. When the appetite is unnatural, the state of the bowels should be carefully regulated, and the patient kept as far as possible from taking things likely to be absolutely hurtful, as convulsions before and during labour are sometimes caused by the habit of indulging in improper and indigestible kinds of food. The remedies serviceable in excessive vomiting are also useful in the gastric disturbances now under consideration. Soda and magnesia are the best antacids in heartburn. In the neuralgic state of the stomach, which occasionally obtains, bismuth, hydrocyanic acid, kreasote, or an opiate plaster to the epigastrium, are useful. Sometimes small doses of acetic acid, or the mineral acids, will relieve the stomach in a remarkable manner; and when the neuralgia recurs at a particular hour of the day, it is generally relievable by quinine. In certain cases, uterine irritation excites the bowels to increased action, and tenesmus and diarrhœa are the results. In such cases, astringents should be given sparingly, unless the lower extremities, depending upon pressure and debility; but there is another form of dropsy incidental to pregnancy, affecting not only the limbs, but the cellular tissue of the body generally: this is the Œdema Gravidarum of the older authors. No other cause than pressure on the vessels was, I believe, known for such a state of things until Dr. Lever pointed out its connexion with albuminuria. Other observers have added to this valuable advance in pathology, and it is now a well-recognised fact, that pregnant women, especially primipara, are often the subjects of Albuminuria, resulting in local and general dropsy, and involving, unless relieved, very grave dangers at the time of parturition. Albuminuria was first pointed out by Dr. Lever and Prof. Simpson in 1843, in connexion with puerperal convulsions; but since that date more attention has been paid to this condition, at the time of labour, than during its early stages in pregnancy. This is a misfortune, inasmuch as little can be done in such cases at the time of parturition; while, if detected early, the disorder can be relieved in the great majority of cases. It has been said that the disorder cannot be arrested during pregnancy; but I have never met with a case that resisted treatment, unless it had been neglected until towards the close of gestation. The cause of albuminuria in pregnancy has been considered to be the pressure of the gravid uterus. It has been found that ligatures applied to the renal veins will produce albuminuria artificially. Its prevalence in first pregnancies, when the abdominal walls are more tense than in multipara; in twin cases; in cases where the attempt is made to disguise pregnancy by tight dressing; and in subjects affected with dropsy of the amnion; and its rapid disappearance after labour, in most cases, seem to favour this view. Probably pressure on the kidneys is one cause of albuminuria; but I have seen it occur in primiparous women of relaxed habits as early as the fourth or fifth month, where the abdominal walls were flaccid, and no apparent pressure or tension existed. The disease appears to me in such cases to depend upon reflex irritation of the kidneys by the gravid uterus, similar to the irritation of the salivary glands, the mammæ, thyroid, &c., and not upon mere pressure alone. It certainly has not the same tendency to occur in ovarian dropsy, or in large fibrous tumours of the uterus, in which the pressure may be quite as great, and sometimes as rapidly induced, as in pregnancy. According to the researches of M. Blot and Prof. Litzmann, albuminuria is not of iron and tonics should be resorted to, in order to repair, as far as possible, the weak condition of the blood which has been produced. The detection and treatment of albuminuria in pregnancy is one of the points of progress deserving the special notice of all engaged in the practice of midwifery. I have no doubt the rate of obstetric mortality may be sensibly diminished by attention to this subject. The urine should invariably be tested for albumen in all cases of œdema of the extremities in pregnant women.

I am not aware that the matter has been observed by obstetric authors, but in some pregnant women the urine, without being albuminous, contains habitually a large quantity of triple phosphates, is of high specific gravity, and has an alkaline reaction during the greater part of pregnancy. The nervous and vascular erethism attendant upon, or produced by, the state of pregnancy, is followed by the same results as other and more marked causes of exhaustion. I have known this Phosphatic Diathesis to exist in cases in which fatty degeneration of the placenta has occurred in successive pregnancies. In one lady who had given birth to eight dead children at or near the full time, this state of the urine was very marked. The death of the children occurred before the end of gestation from placental disease, and was caused by the separation of the placenta before the occurrence of uterine action; or its attachment was so slight that it was separated by the first contractions of the uterus; or the children were born in such a weak condition, that they died soon after birth, leaving the fœtus to die of asphyxia. The treatment in such cases should be that employed in the phosphatic diathesis occurring under other circumstances than pregnancy—namely, the mineral acids, opiates, rest, and a nutritious regimen. Such patients also require, either during or after the completion of pregnancy, preparations of steel, as a marked degree of anæmia is produced by the persistence of the disorder.

Some gravid women experience great distress during pregnancy from the sympathetic Irritation of the Heart, palpitation occurring upon the slightest exertion or emotional disturbance; in others, the respiration is similarly affected, and attacks of dyspnœa, approaching to asthma, harass the patient. These affections are aggravated as pregnancy proceeds; and the effects of mechanical pressure upon the heart and lungs by the ascent of the diaphragm, and upon the great vessels in the abdomen, become added to those of sympathetic irritation.

the gravid uterus. Amongst the most obvious results of pressure are the impediments to the circulation in the lower extremities. The weight upon the external iliac veins, particularly in the upright position, very commonly causes a varicose state of the veins of the legs. This condition is most aggravated towards the end of pregnancy, and in women who have borne large families, or who have been obliged to exert themselves during gestation. The varicose veins sometimes inflame at particular points, or throughout a considerable extent, and the walls of the veins may become thin and burst, giving rise to dangerous hæmorrhage. In other cases, varicose ulcers are formed by the inflammation and suppuration of a patch of varicose veins. Certain inconveniences also arise as the result of pressure on the internal iliac veins. In the latter months of pregnancy, the distension of the internal iliac veins is caused by the pressure of the gravid uterus upon the common iliacs; but in the early months, the pressure is exerted directly upon the internal iliac vessels by the expanding uterus before it has yet emerged from the pelvis. In this way, hæmorrhoids, congestion, and varicosity of the vagina, and a varicose state of the vulva, are caused. In the latter condition, effusion of blood may take place from the veins into the cellular tissue, constituting thrombus, which sometimes attains a considerable size, and proves an impediment at the time of labour. Generally the thrombus is confined to one side, but Dr. Lever has mentioned a case to me of large double thrombus, which I believe to be very rare. Hæmorrhoidal discharges are not uncommon in the early months of pregnancy from this cause, and, in some habits, blood is lost from the hæmorrhoidal vessels for the first monthly period or two after the commencement of pregnancy. Similar disordered conditions of the pelvic veins may afterwards be caused by pressure upon the common iliac. Probably the effects of pressure have some influence in causing a plethoric state of the uterus itself; but as the uterine veins empty themselves partly into the internal iliac, and partly into the inferior cava and renal veins, the early gravid uterus is to a considerable extent defended against the consequences of pressure.

In the management of these conditions, as in all the disorders of pregnancy, it must be remembered that, except in the last resort, the cause of disorder cannot be removed, and that we can only deal in palliative measures. The varicose state of the veins of the lower extremities may be relieved by rest in the recumbent position, and by wearing a roller or an elastic stocking. In the event of a varicose vein bursting, the patient ought to be laid down, and placed with her legs raised above the level of the head until the bleeding has ceased, and pressure should be applied to the ruptured vein. The distension of the hæmorrhoidal and vaginal veins may be relieved by rest, and the avoidance of constipation; and if the veins of the vulva are varicosed, by the well-adapted pressure of an elastic bandage applied to the part.

The pressure of the gravid uterus upon the veins and lymphatics in the pelvis sometimes causes simple Œdema of the lower extremities, in cases where no disturbance is caused by venous pressure. At others, there is œdematous enlargement of the feet and ankles, combined with a varicose state of the veins. The œdema is aggravated by standing or walking, and becomes worse every evening, particularly as pregnancy advances. It is generally relieved by rest in the horizontal position, or, if painful, by an opiate embrocation. It disappears very soon after the occurrence of parturition. Cramp in the legs is a very troublesome affection to some pregnant women; and in subjects in whom it occurs during gestation, the disorder occasionally amounts to intense and continued agony during labour, affecting the muscles of the abdomen as well as those of the lower extremities. It depends partly on the pressure upon the lumbo-sacral nerves in the pelvis, and partly on the irritation of the gravid uterus, or constipated bowel, reflected upon the nerves of the lower extremities, apart from mere pressure. The tendency to cramp is increased by unusual exercise, long standing in the upright position, or by the omission of accustomed exercise. The treatment consists in friction and extension of the limbs during the paroxysm, and the avoidance, as far as possible, of the causes of this painful affection—that is, the bowels should be kept regular, and rest and exercise should be attended to in due moderation. Constipation is prone to occur in pregnancy, partly because of the mechanical pressure exerted on the rectum, and partly because the state of the gravid uterus acts as a contra-stimulant to the intestinal canal. Sulphur, bitartrate of potash, manna, or the lenitive electuary, should be given in cases of constipation, when the bowels are readily moved. In more obstinate cases, castor oil, or the compound rhubarb pill, or an injection of soap-and-water, are useful. There is a very common prejudice in favour of aloes, and this medicine is well suited to cases in which the derivative influence of the gravid uterus has reduced the rectum to a state of torpor. Its effects, however, should be kept within certain limits, otherwise it is apt to excite the uterus. Magnesia should be avoided as a purgative during pregnancy, and it should not be used to any great extent as a means of relieving heartburn, on account of its tendency to accumulate in the rectum. I have seen a very good imitation of sacral exostosis produced by the constant taking of magnesia in pregnancy. Serious complications may occur at the time of labour, or subsequently, from neglect of the bowels, or from habitual constipation during the pregnant state. This is particularly the case with women who have required opiates during pregnancy, in whom accumulations of fæcal matter in the colon are very apt to occur. There may be a daily partial action of the bowels in such cases, but the bowels may become so loaded notwithstanding, as to complicate, favour, and tend to the production of inflammation, fever, or convulsions after parturition.

Strangury, and incontinence of urine, are often met with in pregnancy: in the early months, from irritation of the bladder, the irritation being partly caused by pressure, and partly reflected from the gravid uterus; and in the latter months, chiefly as the results of pressure. Little can be done in such cases beyond enjoining rest, giving an opiate—particularly when the affection occurs in the early months—and taking care that the urinary secretion is kept in as healthy a state as possible. The distension of the diaphragm and abdominal muscles by the gravid uterus is occasionally the source of severe pain in these muscles. This muscular pain may be felt especially in the diaphragm, in the situation of its insertion into the ribs, in the course of the rectus, or in the bellies of the oblique muscles. It is relieved by an occasional warm bath, the use of frictions with olive oil to the abdominal surface, an anodyne embrocation, and especially by wearing a suitable bandage, so as to support the strained muscles. I have sometimes seen these pains, after bleeding and leeching had been tried in vain, relieved at once by the use of a well-adjusted bandage. Occasionally the skin is the seat of great uneasiness, from the distension of the abdomen, becoming cracked, and oozing out a watery secretion. The best relief for this state is the use of oleaginous frictions, an occasional warm bath, and the support of an abdominal bandage.

CHAPTER X.

DISORDERS OF PREGNANCY (CONTINUED).

In the last chapter, reference was made to the disorders of pregnancy depending upon Reflex Irritation and Mechanical Pressure; and we now come to the consideration of Displacements of the Gravid Uterus, and their effects; a morbid state of the uterus and vagina.

Conception may, and does occur in women suffering from Prolapsus or Procidentia, as in cases where the uterus is occasionally reposited, or returns of itself when the patient is in the recumbent position. Under such circumstances, there may be prolapsus or procidentia of the pregnant uterus in the early months. Harvey mentions a case of this kind. Unless abortion should happen while the uterus hangs externally, no other evils but the discomfort of such a state of things and the risk of abortion are usually experienced. After a while, the uterus no longer descends, the ovum acting as a very efficient intra-uterine pessary. All that is required in the way of treatment is the return of the uterus within the vagina by gentle pressure, and the continuance in the recumbent position for a time. Occasionally, however, where the uterus has formed adhesions, and abortion is caused, inflammation and pelvic abscess is the result.

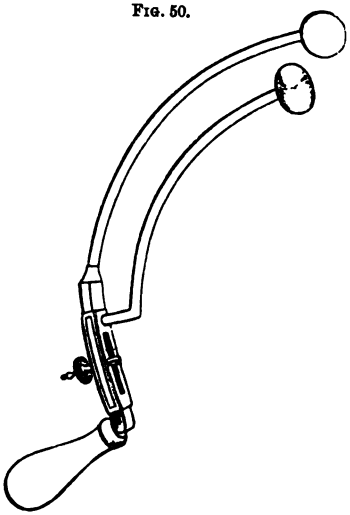
In women who have borne many children, or who are of relaxed habits, or in whom large umbilical hernia exists, the uterus in the latter months of pregnancy hangs over the pubes, constituting Anteversion of the gravid uterus. Occasionally, in these cases, considerable disturbance of the bladder is experienced in consequence of the dragging and pressure exerted upon the neck of the organ. When the anteversion is considerable, the bladder is drawn upwards to a considerable extent; the unwieldy condition of the patient interferes very much with progression; and the loss of the proper axis of the uterus, and the impeded action of the abdominal muscles, become impediments to parturition. In these cases, the duration of labour is very apt to be prolonged beyond the usual term. In the first month or two of pregnancy, the natural position of the uterus is, as already mentioned, a slight anteversion of the organ, as compared with the axis preserved in the ungravid state, and the body of the organ can be felt in front of the os uteri, and between the os and the pubes. This generally produces no other inconvenience save that of pressure on the bladder; but when the anteversion is very marked, as when a womb already anteverted becomes impregnated, or when large accumulations in the rectum take place, the vesical irritation and disturbance become more distressing. In the early months, in marked cases, the patient should be a good deal on her back, and the rectum should be emptied daily by an enema or some mild aperient. The treatment of anteversion in the latter months consists of rest in the supine position, and the use of a proper bandage.

By far the most formidable displacement to which the gravid uterus is liable is Retroversion — an affection noticed by Daventer and some of the early obstetricians, but first observed distinctly by Gregoire, and fully described by William Hunter and Denman. This affection occurs in its most decided form at about the third or fourth month, when the uterus is entirely within the pelvis, and when it is of such large size that any alteration from the natural position occasions great inconvenience to the neighbouring organs. It is usually described as arising from excessive distension of the bladder, through neglect, reserve, or restraint on the part of the patient. It is believed that the full bladder, rising in the abdomen, drags the neck of the uterus upwards, while the bulk of the distended organ presses the fundus uteri backwards. The displaced uterus, by the pressure it exerts upon the neck of the bladder, in turn increases the distension of this viscus, and the retroverted uterus at length becomes fixed across the pelvis, the fundus lying in the hollow of the sacrum, and the os being tilted against the pubes, so as, in the worst cases, to render the evacuation of the rectum difficult, and the bladder impossible. This explanation of the matter, which has been implicitly followed by almost all writers on midwifery, was current, it should be observed, long before the subject of retroversion of the unimpregnated uterus came to be understood. My own observation inclines me to give a different view of the mode in which retroversion of the gravid uterus may occur—a view illustrated by a case which recently fell under my care. A lady, in whom the symptoms of retroversion of the uterus had existed for some years before her marriage, became pregenormously distended, and it is sometimes ruptured mechanically, or its coats inflame and ulcerate, allowing the urine to escape into the peritoneal cavity, and the patient sinks, or dies of peritonitis. If the uterus cannot be replaced, and the water is occasionally and with difficulty drawn off, the bladder gradually enlarges and elongates, and its mucous membrane becomes diseased: muco-purulent, ammoniacal, or bloody urine is passed, and the kidneys may become diseased by the effects of the backward pressure of the urine. The structures between the bladder and uterus may become inflamed, and the patient be destroyed by irritative fever. In some cases all these mischiefs are averted or modified by the occurrence of spontaneous abortion. In others the displacement continues to the fifth or sixth month, without destroying the patient, and it has even been known to go on to the full term without causing a fatal result.

As regards treatment, the first thing to be done is to obviate as far as possible the effects of pressure, by catheterizing the bladder and emptying the bowels by aperients or enemata. In some cases, these means, and directing the patient to empty the bladder frequently, and the bowels daily, are so efficient that no further inconvenience is felt, and the uterus rises into the abdomen as pregnancy advances. When the pressure cannot be relieved by these means, an attempt should be made to raise the fundus uteri mechanically. This should be done by introducing the forefinger of one hand into the vagina, and the forefinger of the other into the rectum, when the os should be drawn down with one finger or the uterine sound, and the fundus elevated with the other. Naegele advises the introduction of the whole hand into the vagina for the purpose of lifting the fundus. In a difficult case, the efforts at reposition would no doubt be greatly assisted by the use of chloroform. The most convenient position for the patient during these manipulations is on her knees in bed, with her head lowered. M. Gariel has proposed that one of his vulcanized india-rubber pessaries should be introduced into the rectum, or into the vagina, and that the fundus uteri should be raised by inflating the pessary. I do not know if this plan has been tried, but the vaginal pessary might prove effective in a case admitting of the mechanical re-adjustment of the uterus. When the uterus was firmly wedged in, it might, however, unless great caution were observed, lacerate the soft parts. If the symptoms are so serious as to threaten the

Vagina are, Uterine Plethora, Hysteralgia, a painful condition of the Round Ligaments, Pruritus, Sanguineous Discharges, and Leucorrhœa.

Fig. 50.



Uterine Plethora in the early part of pregnancy, as the joint result of pressure and the determination of blood to the uterus in the processes of nutrition, may exist to such an extent as to cause bearing-down, heat and pain in the back, and a sense of pelvic fulness, with inability to walk—symptoms which, if not relieved, are pretty sure to produce abortion. On examination per vaginam, the canal is found hot and dry; the uterus is swollen, low down in the vagina, and rigid and painful to the touch. This condition should be treated by the avoidance of intercourse, absolute rest, aperients of the gentlest kind, or mild enemata, the application of leeches to the perinæum or the inside of the thighs, cooling saline medicines, and a light unstimulating diet. When the uterine pain is considerable, an opiate, or hyoscyamus with camphor, should be given, or an opiate suppository should be introduced into the rectum.

Occasionally, in the middle and latter months of gestation a cooling diet, and occasional aperients are necessary in such cases. It sometimes happens that the pruritis has a periodic character, coming on or becoming aggravated at particular times of the day. In these cases I have seen great benefit from the administration of quinine.

Leucorrhœa is a very common affection of pregnancy. The glands of the canal of the cervix share in the increased development of the uterus, and the secretion which forms the thick plug of mucus closing the cervix uteri is frequently in such excess as to cause a constant discharge. The secretion is thick, and perfectly white in colour, as it escapes from the os uteri. It is composed entirely of plasma and mucous particles, but in passing through the vagina it becomes mixed with the scaly epithelium of the vaginal surface. In some cases, the epithelial covering of the os uteri is abraded to a considerable extent, when muco-purulent or purulent matter is secreted from the abraded surface, and is discharged from the vagina with the mucus of the cervix. Sometimes, this abrasion exists before the occurrence of pregnancy, and is only aggravated by the afflux of blood and increased action natural to the gravid uterus. At other times, it originates during pregnancy itself. The subject of the abrasion of the os uteri in pregnancy has been investigated in France by MM. Boys de Loury and Costilhes, and by Dr. Henry Bennet and Dr. Whitehead in this country. The symptoms consist of purulent or muco-purulent vaginal discharge, pain and weight in the lumbar and hypogastric regions, all of which are increased by walking or sustained exertion of any kind. Examined by the speculum, the os uteri is seen denuded of epithelium to a greater or less extent, and secreting puriform matter.

I have ascertained that it is in such cases that the supposed menstruation of pregnancy frequently occurs. Occasionally large quantities of blood are lost from the abraded surface at each catamenial date. If allowed to pass without treatment, besides the debility induced by the constant puriform discharge, and the occasional loss of blood, there is some danger of abortion, or of painful and laborious labour at the full term. In cases of simply mucous leucorrhœa, little is required beyond the use of an astringent injection. In the severer forms of disorder, the treatment should consist of rest, keeping the bowels in a lax state, the use of injections of tannin, alum, the sulphate of zinc, or diacetate of lead, and the occasional local application of the solid nitrate of silver. The application of the nitrate should never be severe, and the employme of the more powerful escharotics must be avoided, lest the should cause abortion. As an astringent, the dilute sulphuri acid, with the compound infusion of roses, or the dilute muriatic acid, may be taken. By these means, severe cases o this kind are often cured. It must be confessed that abortion may, and does sometimes occur, from the treatment; and if the use of the nitrate of silver or astringent injections should cause much pain, they ought immediately to be disused.

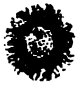
The source of the blood in menstruation, or menorrhagia, during pregnancy, has often been the subject of discussion. Before the modern views respecting the formation of the decidua, it was difficult or impossible to account for the occurrence of a discharge having a menstrual character from the gravid uterus. How could a sanguineous flow issue from the cavity of the uterus when the whole of the internal surface of the organ was occupied by the decidua? Obstetricians were driven to suppose that the discharge must in such cases be poured out from the cervix, the os uteri, or the vagina. In accordance with the modern ideas respecting the development of the mucous membrane of the uterus into the decidua vera, Dr. Matthews Duncan has suggested that the menstrual discharge may be secreted from the decidual lining of the gravid uterus in the early months, before the decidua reflexa comes to be in apposition with the decidua vera in its whole extent. According to the view I have advanced respecting the loss and renovation of the mucous membrane at the menstrual periods, it is not difficult to conceive that in the first part of pregnancy the lower portion of the decidua vera may become broken down and thrown off with a sanguineous discharge. Probably, in cases of threatened abortion, in which there is a coloured discharge for several days or a more considerable period, without the loss of the ovum, the lower portion of the decidua vera is destroyed and formed anew. In several cases which have occurred to me, of menstruation during pregnancy, I have, however, found them, on examining with the speculum, to be cases of abrasion of the os uteri. In the intervals between the periods, the abrasions have secreted pus; but, under the influence of the vascular congestion which occurs at the menstrual dates throughout part or the whole of pregnancy, they exude blood after the manner of a menstrual ulcer. I met in the course of 1855 with two cases of this kind. One case I saw with Dr. Sibson and Mr. Whaley, of Kilburn, and in this the periodical menorrhagia was very violent, but it ceased as the abraded surface became healed. The other case, in which a molar pregnancy went on for several months with regular menstruation, the os uteri being abraded, I saw with Mr. Napper, of Cranley, Surrey.

Pregnant women are occasionally affected with symptoms similar to those met with in cases of Amenorrhœa. In certain constitutions, even while the physiological processes of gestation and lactation are going on, the absence of the stimulus of the catamenial function is felt, and general pallor, œdema of the lower extremities, with other signs or chlorotic anæmia, are the results. I have seen many well-marked cases of this kind. The subject has been slightly adverted to by M. Chailly, and more positively by M. Cazeau. The same thing may happen during lactation, and it is my opinion, that in many cases of anæmia in pregnancy, as well as lactation, the milder preparations of iron, as the ammonio-tartrate or ammonio-citrate, are called for, and should be given with a view to remedy the condition of anæmia. It is necessary to bear the tendency of the pregnant woman to anæmia in mind, as it forms a part of many of the other disorders of gestation. This state of anæmia is increased by the vomiting of pregnancy, and by several other disorders of the gravid state. In ordinary cases, the last thing we should do would be to give any preparation of iron, from the fear of inducing abortion; but when the anæmia is marked, the administration of steel tends to prevent the premature expulsion of the ovum.

The influence of pregnancy upon other diseases is an interesting subject. It is well known that blood drawn from healthy women during pregnancy generally shows the buffy coat, and it is found that all inflammatory diseases have a tendency to a more acute course than usual, and require a more prompt and active treatment than under any other circumstances. This is particularly the case in inflammatory disease of the chest. Certain diseases are more dangerous during pregnancy than at other times. Small-pox and Scarlatina are very fatal—especially the former—from the almost inevitable occurrence of abortion, and the unfavourable condition under which the patient is thus placed. Syphilis is not especially modified by pregnancy; but there is the twofold risk of abortion—from syphilis itself, and from the anti-syphilitic treatment required. There is this peculiarity in the relations the immature ovum from the uterus. The real adhesion between the ovum and the mother is at the points of connexion between the chorion and decidua. At first, this connexion is slight. William Hunter stated that, in the earlier part of gestation, the chorion and decidua may, by delicate manipulation, be separated from each other without laceration. Afterwards, the intimate connexion between the chorion and decidua, and the fusion of the two parts, and of the fœtal and maternal vessels, in the placenta, renders the separation more difficult, and the risk of abortion is consequently diminished after the three or four first months of gestation have passed.

The older accoucheurs paid much attention to the real or supposed loss of the ovum very shortly after impregnation. Married women who passed over a monthly period by a few days, and then menstruated profusely, were believed to have lost an ovum. This was called an Effluxion, if it occurred before the tenth day, "because," as Smellie observes, "the embryo and secundines are not then formed, and nothing but the liquid conception, or genitura, is discharged." In all probability, such cases are not uncommon, and the ovum is unobserved—not from its liquid condition, but because it is so little above the size of the unimpregnated ovule as not to be visible in the discharges. An ovum of fourteen days has been described by Velpeau, and its size did not exceed the adjoining diagram (Fig. 51.) In the expulsion of an ovum of an earlier date than this, the symptoms would hardly differ from those of profuse menstruation.

FIG. 51.



For practical purposes, Abortion may be defined as the premature expulsion of the ovum at any time after the ovum becomes visible, and before the twenty-seventh or twenty-eighth week of pregnancy. Up to the latter date, the fœtus is not viable; but after the completion of the sixth month, it may with care be reared. There are certain differences requiring notice in abortions occurring before and after the end of the second month, dependent on the different size of the uterus, and the altered development of the vascular connexion between the uterus and the ovum before and after the formation of the placenta. The discharge of the ovum between the end of the second month and the twenty-eighth week, has in consequence been termed Miscarriage; but bearing in mind the peculiarities mentioned, it will be convenient in practice to consider all expulsions of the ovum previous to the time

at which the fœtus becomes viable, under the head of A
tion.

This termination of pregnancy is exceedingly frequent.
two thousand pregnant women who applied to the Manche
Lying-in Hospital, Dr. Whitehead ascertained that the
lective number of their abortions had amounted to one th
sand two hundred and twenty-two. Many of these w
young women in their first pregnancies, or women who
not completed the child-bearing epoch. As regards the i
vidual results, Dr. Whitehead found that, of these two th
sand women, thirty-seven out of every one hundred moth
had aborted before they had reached the age of thirty ye
The proportion of women who had lived in wedlock until
menstrual decline, to whom abortion occurred, approached
ninety per cent. There are, in fact, few women who h
passed through the child-bearing epoch, and actually bo
children, who have not aborted once or oftener. This is p
bably one of the subjects open to the greatest improvemen
obstetric practice. Considering that at the last census
married female population of England and Wales, betw
the ages of fifteen and fifty-five, amounted to 2,553,894,
loss of fœtal life must be enormous. The date at which
majority of abortions occur is from the second to the fou
month of pregnancy. Taking the particular pregnancies
which abortion is most likely to happen, there seems to
greater danger of this accident in the first pregnancy, pa
cularly amongst the upper classes, and in those later pr
nancies which occur before the cessation of the menses.

We have seen, while considering the signs and disord
of pregnancy, that the uterus is in reflex relation with m
important organs. These organs react upon the uterus,
prove in many cases the predisposing or active causes of ab
tion. In my work "On Parturition," I stated that I
seen abortion caused by irritation of the Mammary nerves,
when abortions occur during lactation from the irritation
constant suckling. That it is not mere weakness or
haustion in some of these cases is proved by the facts that
mammary secretion may cease upon the occurrence of impr
nation, but that a plentiful supply of milk returns after
occurrence of abortion. The contraction of the uterus af
delivery, from irritation of the mammæ, is well kno
When I first suggested this cause of abortion in some ca
the idea was somewhat roughly criticised; but it has b

adopted in the recent work of Dr. Gunning Bedford, of New York, and Prof. Scanzoni has founded upon it a method of inducing premature labour by irritation of the mammæ.

Irritation of the Gastric nerves will sometimes produce abortion. It is astonishing what an amount of nausea and vomiting the uterus will bear without being excited to expel its contents; and there is a belief, generally well founded, that sickness prevents the occurrence of abortion from rigidity of fibre or imperfect uterine devolution. But cases do occur in which abortion is apparently brought on, as a reflex pathological phenomenon, produced through the medium of incessant gastric irritation. Irritation of the Trifacial nerve may also produce abortion. This happens sometimes from the irritation of cutting the wisdom teeth, the extraction of a decayed tooth, or the irritation of constant odontalgia. Vesical or Renal irritation, as from the presence of a stone in the bladder, or irritation of the kidneys in albuminuria, is sometimes the cause of abortion. Ovarian irritation has a like effect, as shown by the tendency to abortion at the catamenial dates, particularly in women who have been the subjects of dysmenorrhœa. The production of abortion by the irritation of the Rectal nerves is a well-recognised occurrence. It may happen from hæmorrhoidal inflammation, the irritation of ascarides, the action of violent purgatives, diarrhœa, or dysentery, or the opposite condition of excessive constipation. The mechanical effects of vomiting, coughing, sneezing, or straining of any kind, will occasionally cause abortion in delicate subjects.

Irritation of the Uterus and Vagina may excite abortion. Plugging the vagina is sometimes practised as a means of inducing abortion artificially. In abortion or premature labour in the later months, excited by violent horse or carriage exercise, the accident depends upon the irritation of the uterus, and especially the os and cervix uteri, by the head of the child, during the succussion which occurs. Coïtus, plugging the os uteri, disease of the os and cervix, procidentia, anteversion, and retroversion; the implantation of the placenta over the os uteri, cancer, fibrous tumours of the uterus, mechanical injuries and metritis,—may all cause abortion. In abortion depending upon the disease or death of the ovum, it is the irritation of the uterus by its abnormal contents which directly excites the act of abortion. In the case of abortion from the irritation of the uterus by the state of the rectum, minuria; and, according to Lugol, the strumous diathesis—may excite the uterus to the premature expulsion of its contents. Emotion is another important cause of abortion. It may be produced by the emotions of fear, anger, grief, or any other violent mental disturbance. Under the influence of terror and pain, martyred women have aborted at the stake. The expulsion of the ovum has sometimes occurred after death. Of these oxytocic agencies, some affect the nervous centres, and are in this respect to be distinguished from the ex-centric or reflex causes of abortion. The ergot of rye, for instance, passes into the blood, and affects the spinal centre, being specially directed to the lower portion of the spinal marrow, and to that part of it in relation with the uterus. In the case of emotion, the influence is distinct from other causes of abortion in being dynamic or psychical. Others, amongst the causes of abortion now enumerated, probably affect the nutrition and life of the ovum, and in this way lead to abortion.

The amount of disturbance to which some women may be exposed without inducing abortion is extraordinary. Mauriceau relates the case of a woman, in the seventh month of pregnancy, who fell from the window of a house, and, besides extensive bruises, broke one of the bones of the forearm and dislocated the wrist, without aborting. Dr. Henry Davies once told me of the case of a woman, who, throwing some water from a window, lost her balance and fell into the street, breaking both her thighs, but recovered without abortion. Dr. Marshall Hall rendered a frog tetanic by strychnia at the time the oviduct was full of ova, and the ova were not expelled during the tetanoid symptoms, but some days afterwards, when the spasms had nearly disappeared. Dupuytren relates the case of a woman who had become the subject of traumatic tetanus during pregnancy, but who, nevertheless, recovered and went her full time. Other women abort upon the slightest occasion. A habit of abortion appears to be acquired in some cases, and abortions are repeated many times in succession, without our being able to detect any very obvious cause. I have known a woman abort ten times in five years; and another who in eight years had fourteen abortions, and gave birth to one still-born child. Madame Boivin mentions that she had ascertained by dissection, that in women who abort regularly, the uterus has sometimes contracted adhesions to other organs. I have several times

known abortions to occur in women who had been the subj
of sloughing and cicatrization of the vagina, after prev
labours, or who had been affected with pelvic cellulitis
pelvic abscess. In some women it appears as if the ut
could not be developed beyond a certain point.

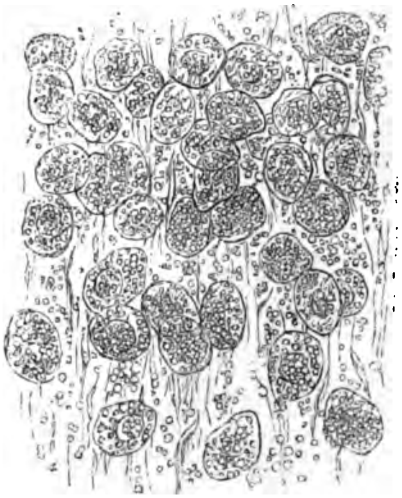
There is one other cause of abortion on the maternal s
which I believe to be of very great importance. In treatin
menstruation and the formation of the decidua, we have s
that the mucous membrane of the uterus is concerned in
menstrual discharge, and that the decidua consists of the alte
mucous membrane itself. Now, if this doctrine of the for
tion of the decidua be correct—and there is hardly
matter within the limits of modern research, upon the subj
of generation, which seems better established—if this be tr
I say, we must push the matter into the domain of patholo
Dr. Simpson has done this in a very able manner in relat
to membranous dysmenorrhœa. Denman and others saw t
the mass discharged in these cases resembled the decidua,
made the comparison between the two substances. But
Simpson, after the true nature of the decidua had been m
out, was able to carry the comparison further, and he
shown that the membrane discharged in membranous dys
norrhœa is, like the decidua, the mucous membrane of
uterus itself hypertrophied, and exfoliated or thrown off a
catamenial period. Many years ago I drew a comparison
tween menstruation and abortion and parturition. As rega
the decidua, there is no great difference between an abort
a few weeks after conception and membranous dysmenorrh
except that in abortion the decidua is loaded with the fruit
the womb, and may be discharged more or less in a state
disintegration. Every abortion really consists in the throw
off of the mucous membrane of the uterus and the ov
which has been developed upon its surface. I believe that
many cases of abortion, as in menstruation of healthy
morbid type, the disintegration and exfoliation of the
veloped mucous membrane, or decidua, is the first step
the process, and the direct cause of the loss of the ov
From this point of view we must consider the show in ca
of abortion, and the continuous sanguineous discharge,
similar to the discharge in menstruation. In many case
happens that abortion is threatened, and there is a colou
discharge for many days without the loss or injury of

ovum. In some of these cases, the discharge probably takes place from the surface of the decidual mucous membrane, as suggested by Dr. Matthews Duncan, in reference to menstruation during pregnancy. Abortion does not take place in such cases, probably because the disintegration of the decidua does not occur at the part at which the ovum or the placenta is implanted upon it, or not to a sufficient extent to injure it. In abortion in the later periods of pregnancy, the comparison between the loss of the ovum and menstruation holds good, only at this time the decidua serotina has become by far the most important part of the uterine mucous surface. In all cases of abortion, this menstrual condition of the developed mucous membrane of pregnancy plays an important part, and is the chief cause of the sanguineous discharge; but in many cases it is probably the actual cause of abortion. The tendency of abortion to occur at the catamenial dates has long been a matter of observation. In abortions occurring at the menstrual dates of pregnancy, the periodical influence of the ovaria, as well as of the uterine mucous membrane, must be considered.

We have now considered the principal causes of abortion referrible to the mother: others remain, in which disordered conditions of the chorion and decidua, or of the maternal and fœtal portions of the placenta, are concerned. There is also another class of causes, in which the fœtus and its diseased conditions tend to the production of abortion.

A new cause of abortion, of great importance, affecting the maternal and fœtal structures of the ovum, has been made out within the last few years, chiefly by the original researches of Dr. Robert Barnes; I allude to Fatty Degeneration of the chorion and placenta. Kilian had noticed a solitary case, but we owe the first systematic account of the disease to Dr. Barnes, who was assisted in his microscopical investigation of the subject by Dr. Hassall. This form of degeneration may affect the secundines at any time between the early weeks of pregnancy and the termination of gestation. Fatty degeneration may exist in the placenta as a post-mortem change—that is, it may occur in utero after the death of the fœtus. It may happen also as the result of the transformation of effused fibrine in inflammatory disease of the placenta, or of a clot of blood in hæmorrhagic effusion. Lastly, it may consist of the metamorphosis of portions of the maternal and fœtal strucextent, the vessels do not carry red globules. The villi and the vascular loops affected with degeneration are knobbed and misshapen in appearance. Dr. Barnes believes the degeneration or retrogressive metamorphosis, to commence mostly in the villi and decidual cells of the placenta. He has pointed out that this state of things must materially interfere with the nutritive and circulatory functions of the placenta, and that if it proceed to any great extent, it must inevitably destroy the fœtus by cutting off the connexion between the maternal and fœtal circulations. Dr. Barnes supposes that, from the friable, non-resilient condition of the degenerated lobes of the placenta, partial separations must occur, leading to hæmorrhage and abortion. He suggests also that partially degenerated bloodvessels may burst, and occasionally lead to intra-placental hæmorrhage, or placental apoplexy. Sometimes the dead ovum is at once expelled, at other times the chorion or placenta

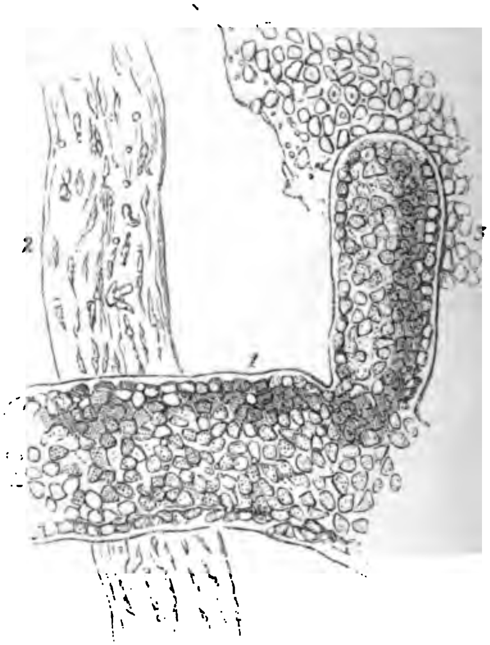
Fig. 53.



Cells of the decidua in a state of fatty degeneration. 420 diameters.

remains in connexion with the uterus, and undergoes a further metamorphosis, so as to consist very largely of fatty matter, before it is expelled. In all probability, many of those cases in which pregnancy repeatedly goes on in the same woman to the full time, and the fœtus is found to have died shortly before the time of birth, the cause of death will be found to be fatty degeneration. (Figs. 52-55.)

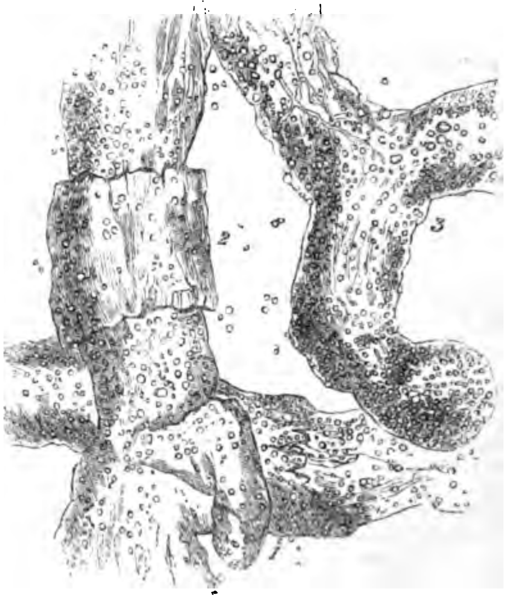
FIG. 51.



1. Vessel with its investing chorion. 2. The same deprived of its chorion. 3. Chorion detached, showing its cellular formation. 420 diameters.

The metamorphosis of portions of the placenta explains many of those descriptions of the placenta in a morbid state, found in obstetric authors before the subject of degeneration was understood. Many years ago I directed attention to the degeneration of the placenta which precedes the date of parturition. Dr. Druitt has recently contended, that in the normal placenta, at the full time, the signs of commencing fatty degeneration are often present, and this is, no doubt, true; but, under healthy conditions, the fatty metamorphosis cannot be extensive, otherwise the health of the fœtus could not be preserved. As regards the cause or origin of the fatty degeneration of the placenta, chorion, or decidua, Dr. Barnes

FIG. 55.

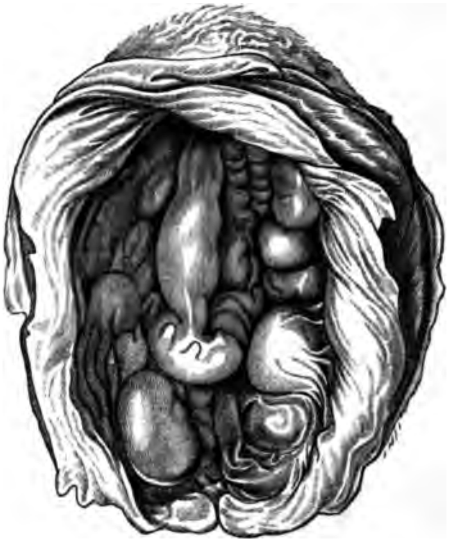


1 and 2. Branches partially deprived of chorion, and showing much fatty matter. 3. Bloodvessel entirely deprived of its chorion, and in a state of degeneration. 420 diameters.

refers it chiefly to an imperfect germinal or formative force on the side of the ovum. He is also of opinion that, dependent as the ovum is upon the vascular system of the mother for support, any imperfection in the nutriment supplied to it must contribute to the diseased state of the placenta. It is only upon this hypothesis that we can hope to control the malady, by rendering the system of the mother as healthy as possible during gestation. The later researches of Dr. Barnes lead him to believe that constitutional syphilis, maternal or paternal in origin, is a frequent cause of fatty placentæ.

The placenta is subject to congestion and inflammation and their results, and these affections are not unfrequently the causes of abortion. Congestion of the placenta leads to what is termed apoplectic effusion. Blood may be poured out either on the fœtal or external surface of the placenta; it may escape into the parenchyma of the organ; or it may be poured out on the maternal surface. (Fig. 56.) The loss of blood may lead to the death of the fœtus, and in this way produce abortion; or it may excite contraction of the uterus and separation of the ovum. In other cases, the blood effused coagulates, its fluid portions are removed, and a fibrinous mass remains without doing any great injury. In inflammation of the placenta, or Placentitis, effusion of lymph may occur, or the disease may pass on to hepatization, suppuration, or gangrene. Sometimes, when the inflammation affects the internal surface of the placenta, adhesions form between the placenta and the external surface of the ovum. In this way, the placenta has been found adherent to the forehead or body of the fœtus. Such is the probable explanation of a remarkable plate in Dr. Lee's illustrations of female pathology. This disease has been investigated by Brachet and Wilde, and one of the earliest and most elaborate memoirs of Prof. Simpson was chiefly devoted to this subject. Its symptoms are obscure, consisting of pain in the uterus, near the site of the placenta, pains in the back and thighs, and general fever. In cases where I have suspected placentitis, I have examined with the stethoscope, but have not found any modification of the uterine sounds. The causes of placentitis are not very obvious, beyond mechanical injuries, and the great afflux of blood to the organ, which occurs during pregnancy. Congestion and its results are probably common causes of abortion, though it is by no means certain that in all cases of abortion in which effused blood is found in the placenta, or the membranes, the effusion has been the cause of abortion. In many cases, the effusion occurs, without doubt, during the progress of abortion,

FIG. 56.

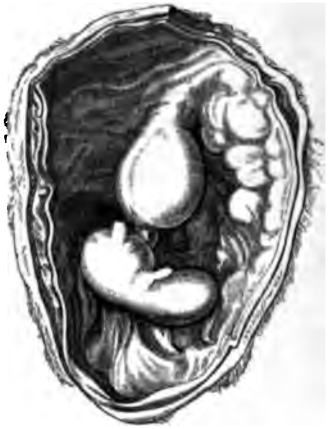


An apoplectic ovum: blood being effused in masses under the fœtal surface of the membranes.

from various causes. The treatment of placentitis and placental congestion consists in local or general bloodletting, according to the amount of pain and the constitution of the patient, counter-irritation over the uterus, and other means for equalizing the circulation. Dr. Simpson is of opinion, that many of the cases of repeated abortion, in the same person, depend upon placental congestion. The placenta is liable to other diseases, which have a tendency to repetition, such as calcareous degeneration, tubercular deposits, and atrophy or hypertrophy. In the case of a syphilitic ovum leading to abortion, the placenta is very commonly diseased.

When from any cause, the fœtus dies, the circulation in the fœtal portion of the placenta is suspended; this in turn affects the circulation on the maternal side; the ovum becomes a foreign body, and abortion generally takes place. Sometimes, however, the placenta is still nourished imperfectly, and the dead ovum is retained *in utero* for a variable time. The fœtus is liable to many diseases which may lead to the death of the ovum, such as inflammation of its serous membranes, dropsies of the serous cavities, or the amnion, disease of the liver or kidneys, tubercular disease, diseases of the umbilical cord, knots upon the cord, twisting of the cord tightly round the neck of the child, and various other affections which are sufficient to destroy its vitality. (Fig. 57.) I have seen a case, in which the head was nearly amputated by the twisting of the cord round the neck. Probably a diseased ovum excites the uterus to expulsive contractions in many cases, before actual death of the ovum has occurred.

FIG. 57.



Ovum shewing morbid enlargement of the umbilical cord.

CHAPTER XII.

TREATMENT OF ABORTION.

Among the first symptoms of abortion are sanguineous discharge, and the occurrence of lumbar, hypogastric, and coxal pain. The pains which precede abortion are very much like those which precede or accompany a catamenial period. Some women abort, however, without having suffered much, if any, pain. It frequently happens that a distinct rigor, or frequent shiverings, usher in abortion. There is sometimes diarrhœa, and, still oftener, an irritable condition of the bladder. Coldness of the breast and abdomen is sometimes complained of, and there is often a cessation of sickness, where this has been troublesome. On being called to a case of supposed abortion, an examination should always be proposed, and made, if possible. It may happen that in cases of supposed abortion there may be no pregnancy at all. Great care should be taken, in digital examinations, not to give pain nor use any violence, lest the tendency to expulsion of the ovum should be increased. In threatened abortion, the os and cervix uteri will generally be found open to some extent, and the body of the uterus may be felt in front of the os, but lower in the pelvis than natural, and hard, as if firmly contracted. When abortion is actively proceeding, the ovum, or part of the ovum, may sometimes be felt high up in the cervical canal, or it may be partly extruded from the os uteri.

The first consideration, in a case in which the symptoms of threatened abortion have occurred, is whether or not the ovum can be preserved. With this end in view, all irritations of a reflex kind should be avoided, or removed, as much as possible. General, local, or vascular excitement should be treated by a soothing regimen and diet. It is rare that cases are met with requiring general bloodletting; but leeching is sometimes useful in cases of uterine plethora, particularly when the symptoms occur at what would, in the absence of pregnancy, have been a catamenial date. The leeches should be applied to the inside of the thighs, or the perinæum. When nervous excitement predominates, a full opiate is of great service. Opiates, in full doses, are also especially called for when there is intermittent uterine pain, or the continued pain of the back and lower part of the body similar to painful menstruation. Dr. Fleetwood Churchill has given the cannabis Indica with good effect as an anodyne, and with a view to its restraining sanguineous discharge. In the earliest abortions, astringents are very valuable, the loss of blood in such cases very much resembling menorrhagia. The acetate of lead, in combination with opium, the mineral acids, the oxide of silver, alum, gallic acid, are the best remedies of this kind. If the discharge is profuse, iced drinks should be given. Otherwise, the beverages of the patient should be cool, without being absolutely cold, in order to avoid uterine contraction. In the treatment of abortion, it must always be borne in mind, that in diet and medicine any agents which excite contraction of the uterus may arrest hæmorrhage for the moment, but with the danger of exciting further separation of the ovum. We must be careful, therefore, not to excite any powerful uterine action. The local application of cold to the vulva, and the introduction of sponge, or pieces of lint, dipped in water, into the vagina, are very useful, within certain limits; but it must be remembered that excessive cold excites uterine contractions, and so, also, does the sponge or linen plug, if it should be large enough to irritate the vagina mechanically. Perhaps the most important of all the means at our disposal for the arrest of abortion, is rest, in the horizontal position. The patient should be kept in bed in a cool apartment, lightly covered with clothes, as long as any coloured discharge continues, and for some days afterwards she should be kept upon a couch, and not allowed to assume the upright position or to walk. When the uterus is in the irritable and congested condition which accompanies abortion, the standing posture, or considerable movement of any kind, greatly adds to the probabilities of abortion. The mind of the patient should be kept as quiet as possible, and all exciting or alarming intelligence withheld from her. The bowels should be regulated, if necessary, with the mildest laxatives. I prefer the senna confection, with a little bitartrate of potash, as an aperient. Castor oil, in my experience, irritates the uterus and mammæ, and should not be given. When the threatening of abortion has occurred at a catamenial date, every precaution should be taken, as the next monthly period comes round, in the way of avoiding irritation, and preserving quiet of body and mind. Every pregnant woman should be told to take note of the catamenial dates throughout pregnancy, and observe greater care than usual at these times, particularly if she has been the subject of abortion. The attempts to prevent abortion should be carried out perseveringly, as it sometimes happens that women suffer from the symptoms of abortion for a considerable time, slight sanguineous discharges lasting for weeks, and yet, with continual care, they go on to the full term. It sometimes occurs that the bleeding is very profuse, and the os uteri so closed that the finger cannot possibly be introduced into the uterus. All the more powerful astringents may have been tried in vain. In such cases the vagina must be plugged firmly with lint or sponge, or, which is still better, in extreme cases, by an air-pessary. These means arrest the bleeding almost invariably, and tend to promote coagulation at the mouths of the bleeding vessels. If, however, it is necessary to continue the plugging for any length of time, the uterus becomes excited by the mechanical irritation, and throws off its contents. Sometimes the loss of blood is so great as to require the free administration of brandy, ammonia, and other stimulants. As abortions frequently spread over a considerable time, every care should be taken to support the strength of the patient. In abortions at the fourth or fifth month, the hæmorrhage may be so profuse and sudden as to be alarming from the first. This is particularly the case in abortions occurring about the time of the cessation of the catamenia. In such cases, if the hæmorrhage cannot at once be arrested by astringents, cold, and the tampon, the membranes should be ruptured with a view to stop the hæmorrhage, and to excite expulsive action of the uterus.

When an abortion is threatened, the accoucheur should order all the discharges to be saved for his examination. Every clot, and every portion of solid matter should be carefully inspected. Otherwise it may happen that the patient or her nurse shall tell you she has aborted when she has not done so, coagula having been mistaken for the ovum. Or it may occur that the ovum having passed unnoticed, and slight or profuse hæmorrhage continuing, as it sometimes does, for a considerable time, the accoucheur is puzzled by expecting an abortion long after it has been actually accomplished. In connexion with these points, it must be borne in mind that cases occur in which the ovum appears to be dissolved, and slowly discharged with sanguineous matters, just as the decidua is discharged in the lochia after parturition. A delicate ovum of a few weeks may disappear within the uterus, as occurs in certain cases of molar gestation, and the membranes may be broken down and discharged in the form of detritus. Either of these three cases may prove very embarrassing to the practitioner. Whatever care may be observed, cases will occasionally occur in which women who have passed two or three menstrual periods, and exhibited the signs of early pregnancy, will be seized with the symptoms of abortion, and suffer from a sanguineous discharge for a considerable time, without passing any detectable portions of an ovum. After this the patients may menstruate regularly, and it becomes exceedingly difficult, or indeed impossible, to decide whether they have aborted or suffered from a temporary suppression only.

The indications which should make us abandon all hope or intention of saving the ovum are, sudden losses of blood to an extent which imperils the health of the mother, or such a continuous drain as seriously to endanger her life; it being also nearly certain that in such cases the ovum is diseased or already dead. If, on examination, we can feel the ovum at the os uteri, or in the cervix uteri within reach of the finger, we may be certain that its expulsion is only a question of time. As a rule, there is little hope of saving the ovum after the rupture of the membranes and the discharge of the liquor amnii. I have, however, seen more than one case in which gestation went on to the full term after the discharge of the liquor amnii in the early months. Fœtid discharges, particularly in early abortions, are a pretty sure sign of the death of the ovum.

When all expectation of saving the ovum has been abandoned, means should be taken to obtain its removal from the uterus. If the bag of the early ovum can be felt with the finger in the cervix uteri, it can generally, by careful manipulation, be separated from the uterus, and got away by the finger alone. Sometimes it is necessary to introduce the hand into the vagina, in order to get the finger into the uterus; and if the hæmorrhage is alarming, the case urgent, and the os uteri sufficiently dilated to admit the finger, there need be no hesitation in adopting this measure. I have never seen any ill effects arise from such an introduction of the hand and finger. When the os uteri is undilated, and the hæmorrhage is great, Dr. Simpson recommends the introduction of one of his sponge pessaries, with a view to the mechanical dilatation of the os and cervix. The only precaution necessary in such cases, as in all instances in which sponge is used in the vagina, is not to allow the sponge to remain long enough to become fœtid. The ergot of rye, and the cannabis Indica, may be given for their oxytocic effects in cases where it is thought unadvisable to remove the ovum, or portions of the ovum, mechanically. Galvanism has been suggested by Dr. Robert Barnes, and from what I have seen of its action in cases of intra-uterine polypi I have no doubt it would contribute to expel an ovum in a difficult case of abortion. We may turn the reflex connexion between the rectum and the uterus to great account in the treatment of abortion when there is no hope of saving the ovum. A drastic cathartic enema will often complete the expulsion of an ovum in the most rapid manner. Various instruments have been proposed and recommended for the mechanical extraction of a partially-detached ovum. There is, however, no instrument equal to one or two fingers when they can be introduced. The last invention of this kind is an instrument proposed by Dr. Fleetwood Churchill, on the principle of the familiar apparatus for getting a cork from the inside of a bottle. In France, a small forceps, somewhat resembling the lithotomy forceps, is used for the same purpose. Dewees invented a wire crotchet for the extraction of the ovum. It must be said, however, that, with all instrumental devices for the removal of the embryo, there is danger of injuring the uterus, and with the hand in the vagina, a case can hardly occur in which the embryo and membranes, or portions of the latter, when retained, cannot be detached and brought away by the finger. Time and patience are sometimes necessary for this manipulation, but I have never known it fail.

I have seen cases where it was necessary to give chloroform before introducing the hand to get away the membranes or placenta. In a case I saw with Mr. Ballard, of a retained placenta in an abortion at the fifth or sixth month, no other means would have enabled us to extract the remains of the ovum. The ordinary modes of procuring its removal had been tried in vain. The patient was in such a state of frenzied excitement that any introduction of the hand would have been impossible while she remained conscious. The cord had broken, the placenta had been retained thirty-six hours, and there was no choice but that of leaving the placenta or giving chloroform. There was no difficulty after this in introducing the hand, but the placenta had to be peeled from the surface of the uterus. The dangers of retained placenta are well known, and in cases of difficulty I should not hesitate to advise the use of chloroform for its removal.

The condition in which the ovum is expelled varies greatly in different cases. The most favourable way in which an early abortion can occur is where the detachment of the entire ovum takes place, before the act of expulsion occurs. The perfect ovum is then expelled at once, and the uterus contracts without much hæmorrhage. In other cases, the membranes are ruptured, and the small fœtus comes out alone, or enveloped in the amnion; or the decidua and membranes may be discharged piecemeal, leaving the fœtus to escape afterwards. As a general rule, the membranes remain after the expulsion of the fœtus; and the earlier the abortion, the longer the membranes or placenta have a tendency to remain. This is probably owing to the firm adhesion of the thick decidua vera to the internal superficies of the uterus, and the feeble power of the uterus to contract on its contents. Sometimes the membranes of an early ovum will remain for weeks, but in such circumstances there is not the same tendency to decomposition and its dangers, as there is in the case of the placenta at the full term. In some cases, the ovum, enveloped in the amnion and decidua reflexa, in the shape of a perfect bag, is expelled in the early months, and a careless observer would say that the abortion was completed, but after this the thick decidua vera has to be discharged. Sometimes this is expelled entire, as a mould of the uterus, at others it comes away in thick pieces, or it may be broken down and expelled, so as to elude detection.

The mechanism of abortion varies considerably, according to the time between conception and the term of natural labour at which the accident happens. No doubt abortion may occur in cases where conception has taken place just before a period, when the motor act of expulsion would probably be limited to the Fallopian tubes, the ovum being carried out of the uterus with the menstrual discharge. In cases occurring in the early months, the canal of the cervix and the os uteri have to be dilated before the ovum can pass, and this process of dilatation occupies a considerable time, frequently causing much suffering. When the dilatation has occurred, the ovum is expelled by the contractions of the imperfectly developed uterus. These contractions occur periodically, and are accompanied by periodical pains, as in labour at the full term. The nearer the time at which the abortion takes place, is to the time of labour, the more closely do the pains and the motor action and mechanism resemble those of natural parturition. In abortions occurring after the formation of the placenta, the tendency, as regards the expulsion of the ovum, is to imitate labour at the full term. The cervix uteri is slowly dilated, the membranes ruptured, and the fœtus expelled, to be followed, at a longer or shorter interval, by the membranes and placenta. In the early months, the difficulty occurs, not in the passage of the fœtus through the pelvis, but in the dilatation of the undeveloped cervical canal. As gestation advances, and the cervix uteri becomes developed, the difficulty of passing through the cervix becomes diminished, while that of passing through the pelvis is increased. When the ovum is small, the contractions of the uterus are chiefly or solely concerned in its expulsion; but when it is large enough to distend the vagina, the abdominal and respiratory efforts are called into play.

Usually, an abortion is not attended by any great danger. Women recover rapidly from the loss of an ovum, and there is a remarkable aptitude for conception afterwards. They do, however, sometimes perish from loss of blood, convulsions, or rupture of the uterus. They are also liable to the dangerous and fatal affections which attend the puerperal state. Tetanus, resembling the traumatic disease in character, has been known to occur after miscarriage, and in rare cases blood has passed through the Fallopian tubes into the peritoneum, causing death by peritonitis. Abortion occurring from small-pox and scarlatina is especially dangerous to the mother. When women abort frequently, great damage is done to the general health; a profound anæmia is caused; and patients may die of secondary diseases arising out of the debility induced by recurrent miscarriages. When the whole of the ovum has been expelled, it is rare to meet with any profuse post-partum hæmorrhage. The uterus is at once so diminished in size as to prevent the risk of bleeding. It happens, however, that occasionally small portions of the membranes are left *in utero*, and are a source of irritation and bleeding for weeks after the loss of the ovum. When the entire ovum is extruded, or brought away completely in detached portions, the woman is at once in a state of ease and safety. A discharge, similar to the lochia, generally continues for some days. As regards rest and other management, a patient, after a severe abortion, should be cared for in the same way as a woman who has been delivered at the full term—that is, she should be kept in bed, and ordered a light unstimulating diet, until she has regained her strength. The breasts are sometimes stiff and painful, but rarely give much trouble after abortion.

We must take cognizance of diseased states of the placenta in the treatment and prevention of abortion. When the fœtus is threatened with death because the placenta does not act sufficiently as an organ of nutrition and respiration, we may, through the mother, act upon the placenta, and assist it in the performance of its functions. Dr. Power prescribed the inhalation of air containing an increased quantity of oxygen, or the use of medicines containing a large proportion of oxygen in a loose state of combination, as nitric acid, in cases where the child has been lost repeatedly in the latter months of pregnancy. Dr. Simpson states that he has found chlorate of potash useful in cases where the fœtal respiration is imperfect. Every care should be taken in such cases to keep the blood of the mother in a healthy state. It is evident that the sanitary condition of the fœtus must mainly depend on the condition of the arterial blood of the mother, this being the medium in which the embryo respires. It has been recommended that, in cases of repeated peritonitis or cerebral disease in the fœtuses of the same mother, mercurialization and other means should be employed with the view of reaching the ovum through the maternal circulation; but, in the present state of our knowledge, the means of diagnosis in diseases of the fœtus are too obscure to render therapeutics of much value. In syphilis affecting the mother, or when the father is syphilitic, there can be no question of the propriety of mild mercurialization as a means of warding off the dangers of abortion, regard being had to the fact, that the careless use of mercury may itself be the cause of abortion. In the prevention of abortion from fatty degeneration of the placenta; the strength of the mother should be supported in every way. The chlorate of potash, nitric acid, mild preparations of iron, and, above all, fresh air, should be recommended. The treatment of fatty placenta should be the same as fatty heart, or fatty degeneration of any other organ.

The Prevention of abortion is an important subject. The whole of the treatment of the disorders of pregnancy has a direct bearing upon this subject. In women who abort from habit, when the nervous system is chiefly concerned in the production of the accident, all emotional disturbance and reflex sources of irritation should be avoided as far as possible. The pregnant woman should not suckle, or be subjected to any mammary irritation. Mr. Lloyd has related a case in which a small tumour having been removed from the breast of a pregnant woman, she aborted, and died of metritis. Irritation of the dental nerves should be guarded against. The rectum should be remembered, not merely as a neighbour to the uterus, but as possessing an excitor surface in reflex relation with the uterus. Ovario-uterine and vaginal irritation should be soothed, and excitement avoided, particularly at the catamenial dates. It is a useful point in the Periodoscope I constructed some years ago, and some thousands of which have been used by the profession, that it points out, at a glance, the catamenial dates of any pregnancy. The late Dr. Griffin, of Limerick, recommended large doses of quinine in the case of women who abort repeatedly at the same date of pregnancy. Mr. White, of Manchester, recommended cold or tepid bathing, with success, as a preventive of abortion. Some accoucheurs advise a daily enema of cold water, in women of weak, irritable habit. When the tendency to abort is very strong, nothing is so likely to prolong gestation to the full term as absolute rest in the horizontal position. When all other means fail, an attempt should be made to eradicate the abortive diathesis by a year's marital separation, and a tonic treatment in the meantime.

CHAPTER XIII.

MOLAR PREGNANCY.—BLIGHTED OVA.

Certain matters are occasionally discharged from the virgin or unimpregnated female, which it becomes necessary to distinguish from the genuine results of fecundation. These consist of masses of squamous epithelium from the vagina; fibrinous collections from the cavity of the uterus; and the membranous product expelled in some cases of dysmenorrhœa. There can be no difficulty in recognising the flakes or tubular pieces of squamous epithelium, exfoliated from the vagina.

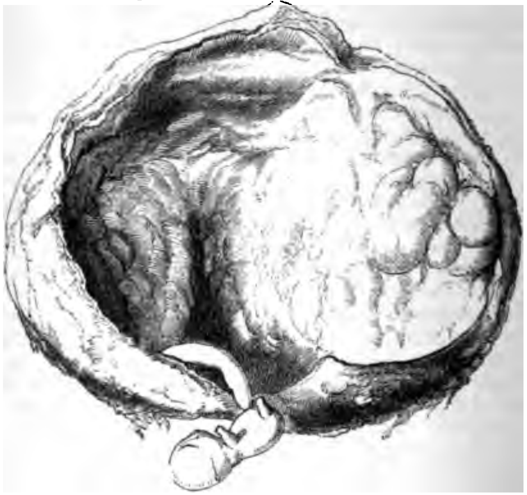
The fibrinous masses expelled from the uterus resemble an almond in size and shape, being to some extent casts of the uterus; they are smooth externally, and possess a very imperfect central cavity. The dysmenorrhœal product consists of the uterine mucous membrane, exfoliated in a more or less perfect form. When entire, it has the shape of the cavity of the body of the uterus, is rough externally, and smooth within, having a distinct triangular cavity, when discharged from the nulliparous uterus, with two openings above, and one below, at the sites of the Fallopian tubes and the canal of the cervix uteri. In the case of the multiparous organ, the dysmenorrhœal bag is ovoid in shape. There are, of course, no traces of funis, membrane, or fœtus. More frequently, the membrane is thrown off in detached portions. Examined microscopically, the squamous epithelial masses consist of quantities of epithelial scales. The fibrinous masses are composed of filaments of fibroid material arranged in bands, and myriads of granular corpuscles, similar to exudation corpuscles. In the true dysmenorrhœal membrane, the convoluted utricular glands are found, with their openings on the smooth internal lining of the cavity, and the cæcal extremities of the glands upon the rough or external surface. The older writers included polypi and fibrous tumours in the list of moles; but the above constitute what are now considered as False or Spurious Moles.

The Genuine Moles, which are the result of impregnation, are of various kinds, consisting of different forms of degeneration of the membranes of the ovum. We can readily distinguish the varieties of mole depending on the carneous or fleshy, the hydatiginous, and the fatty and other degenerations of the membranes. None of these cases can occur without conception. Formerly great confusion prevailed upon this subject. Many authors believed that fleshy moles might occur in nuns and others presumed to be virgins, without the occurrence of intercourse. Percy believed that hydatids were independent animals, and that their production was compatible with the purest chastity. Denman thought they sometimes originated in the uterus as independent formations, and Sir Charles Clark inclined to the opinion that uterine hydatids might exist apart from pregnancy. Cases are recorded, in which uterine hydatids have been retained long beyond the usual period of gestation. Madame Boivin, Baudelocque, Ryan, Desormeaux, and Velpeau, are quoted by Dr. Montgomery, as being in favour of the belief that this form of degenerated ovum may be retained for many months or even years after the ordinary date of labour. I am not aware that any recent case of this kind has been observed. The tendency of all modern research, moreover, has been to demonstrate that the genuine mole cannot occur except as the result of impregnation, and the degeneration of a true ovum. In some instances of twin conception, one fœtus has disappeared under the influence of hydatiginous degeneration, while the other has continued healthy up to the full term. It is related of the celebrated anatomist, Beclard, that he was born under these circumstances.

When an ovum is rendered unfit for continuing the development of the embryo in the early weeks of gestation, by the effusion of blood between the membranes, or into the substance of the chorion, or by any other disease of the membranes, it may not be expelled at the time, but remain *in utero*, and undergo the changes which constitute carneous degeneration; or there may be a partial separation of the ovum from the uterus, followed by an attempt to repair the mischief by the reunion of the separated portions. The fibrin of the effused blood becomes pale and semi-organized, and a perverted nutrition of the membranes goes on. The diseased membranes increase in bulk, but become dense, and quite unfitted for the development of the fœtus, which may remain of the same bulk as when the effusion or separation commenced, or become atrophied. This may continue for three or four months, until at length the degenerated ovum is expelled, consisting of the nest-like membranes and a small embryo of two or three weeks' growth, or in some cases the fœtus may have disappeared, and traces only of the umbilical cord remain. Such are the main points connected with carneous degeneration of the ovum. It has often been pointed out that such cases are of considerable importance in a medico-legal point of view. A husband, for instance, may have believed his wife pregnant, and after his absence from home for several months she may abort on his return, of a fœtus so minute as to give rise to a suspicion of her fidelity, unless such a matter could be explained by the death, retention, and degeneration of the ovum.

The next form of embryonic degeneration to be considered is the hydatiginous variety. The latest and best account of hydatiginous degeneration of the ovum is that by Dr. Barnes, in the 'British and Foreign Medico-Chirurgical Review,' contained in the volume for 1855. In this article, the origin of the disease from the perverted growth of the villi of the shaggy chorion is very clearly traced. When treating of the chorion and placenta, we have described the clavate villi of the chorion, and the layers of cells which they contain. These villi increase by a process of gemmation or budding, very similar to the growth of the roots of a tree. From the sides of one villus, other villi, by a process of cell-growth, sprout out, and from these, in turn, others arise. Under normal plastic influences, a due proportion is preserved between the increase of the nutrient and depurative powers of the chorion and decidua, and the requirements of the enlarging embryo. But it sometimes happens that this growth of the villi is abnormal, and the cells they contain increase in size, and become dropsical, constituting the hydatiginous degeneration of the ovum. The hydatids themselves, in the recent state, are full of transparent fluid, and are either round, pyriform, or oblong in

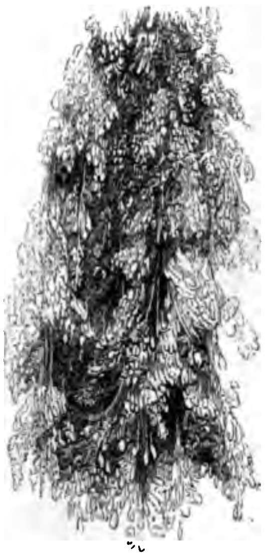
FIG. 58.



Blighted ovum with carneous degeneration of the membranes.

shape, the size of the vesicles varying greatly. Some of them are borne upon pedicles, others are growing from the walls of larger hydatids. Mr. Paget, following Mettenheimer, has pointed out that, on the walls of the primary vesicles, buds appear and develop into separate hydatids; just as the buds protrude from the healthy villi, to produce, by normal growth, new villosities. The pedicles of those hydatids, which appear stalked, are formed of the remains of the base of the villus at the expense of which the hydatid has been formed. As a rule, the activity of the growth and increase of the villi are, Dr. Barnes observes, greatest in early pregnancy, and it is at this time that the hydatiginous degeneration is most prone to occur. Drs. Ramsbotham and Montgomery believe that small portions of placenta, retained *in utero* after parturition at the full term, may become the nucleus of hydatiginous formations; but Dr. Barnes combats this view, from the general history of hydatiginous formations, and the destruction of the fœtal vessels of the placenta, which occur at the time of birth. This question is a very interesting one, and must be considered to some extent as still unsolved. No doubt, the tendencies to the formation of hydatids diminish with advancing pregnancy, but it is not clear that there is any difference between a portion of placenta adherent to the uterus after labour at the full term, and the whole placenta adhering to the uterus after the death of the fœtus, but without exciting the expulsion of the ovum. This form of degeneration frequently commences at a very early date of gestation, and the destruction of the embryo is much more complete than in the fleshy variety of mole. Growth is limited to the chorion and

Fig. 59.

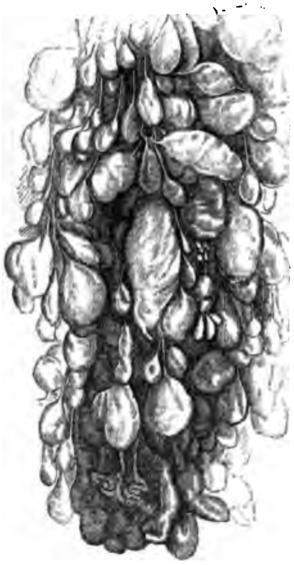


Commencement of hydatid degeneration of the chorion.

the diseased villi, so that all traces of the fœtus generally disappear, the uterus being filled with a mass of hydatids, of various sizes.

Uterine hydatids were compared by Gooch to currants, and by Cruveilhier to a bunch of grapes. Dr. Barnes quotes the objections of Mettenheimer to the comparison of Cruveilhier, and gives the description of Mettenheimer himself. This accurate observer considers the chorion, which is itself a large vesicle or bladder, as the centre of the whole growth. On the walls of this great vesicle, a new generation of cysts is formed, and each of these cysts has the power of producing one or many daughter cysts; or, to use his precise words, "Berry grows out of berry, and the stalks do not unite berries with principal stems, but berries with berries, and, lastly, with a central mother cyst." This arrangement of the vesicles is very well shown in the annexed engraving of a portion of a mass of hydatids, from a preparation by Mr. North, in the museum of St. Mary's Hospital. In the patient furnishing this preparation, enormous quantities of hydatids were expelled at the fifth month, the symptoms being alternate hæmorrhage and watery discharge.

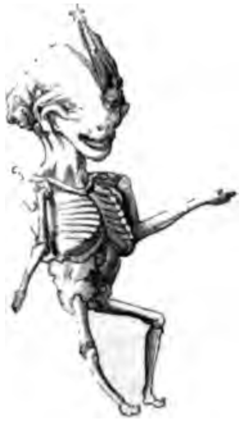
FIG. 60.



Portion of an hydatid mass.

In a third form of degeneration, occurring at a later period of gestation, the placenta may become so diseased as to be unfitted to carry on the nutrition of the fœtus, or the fœtus may die, or be destroyed by disease of the cord, without in either case inducing separation of the placenta from the uterus. The nutrition of the placenta may go on ore or less imperfectly, and the fœtus, under these circum-ances, becomes shrunken and attenuated to an extraordinary ·gree. It sometimes occurs that this is the case in twin ·station. Indeed, it seems more prone to happen in twin .an in other cases. It may then occur that the shrivelled ·tus may be expelled at some period of pregnancy, the ·erus retaining the other to the full term, or the shrivelled id the living embryos may be retained together, and the oman delivered of a full-grown fœtus and one of two or ree months at the full term. Such cases are often con-unded with cases of super-fœtation. Dr. Simpson has inted out, that when the dead fœtus is retained with a ing twin, it becomes flattened by pressure between the ing ovum and the uterus of the mother. Dr. Barnes is opinion that in fatty degeneration of the placenta to such extent as to destroy the embryo, two or three weeks om the death of the fœtus is the usual time within which e uterus is excited to expel its contents; but I have en well-marked cases of fatty degeneration, in which the ·tus died in the early months, but was not expelled until the

FIG. 61.



Shrunken fœtus after retention *in utero*, from a preparation in St. Mary's Hospital Museum.

full term. It is in the highest degree probable that in all cases of death and retention of the ovum, after the formation of the placenta, the retained membranes become the subject of fatty degeneration, and that this also occurs to a considerable extent in what are called fleshy moles.

The symptoms of molar pregnancy vary considerably in the different forms of this disease. In the carneous moles there is an arrest of the breeding symptoms, but the patient remains out of health. The ovum, from the time of its death, becomes to a great extent a foreign body, and is a source of irritation to the system generally. No increase of size takes place, so that, at the fourth or fifth month, the uterus may not be larger than it should be in the fifth or sixth week of normal pregnancy. The complexion is muddy, and the breath fœtid, with loss of appetite and digestion. Hæmorrhage frequently occurs as the degeneration of the membranes proceeds, but not to any great extent, on account of the small size of the uterus. There is sometimes a constant sanious discharge, in which case the health suffers more than usual. But in many of these cases, the symptoms, it must be confessed, are very obscure. This is because the death of the ovum occurs before the symptoms of pregnancy assume a positive form, and while the uterus is comparatively undeveloped, so that there is a considerable resemblance between these early moles, and those mixed cases of amenorrhœa and menorrhagia, frequently met with in practice.

In the hydatid mole, the symptoms are more strongly marked than in the fleshy variety. When the ovum has taken on the hydatiginous form of degeneration, the increase is often enormously rapid, so that at the fifth or sixth month the abdomen is as large as it should be at the end of pregnancy, or even larger. The shape of the uterus is frequently altered from the usual pyriform outline, its growth extending laterally on both sides; or it becomes irregular in form. With the marked increase in size, there is the absence of all fœtal movements, and of the sounds of the fœtal heart, combined with a dense uterine tumour. There is frequently also, after the three or four months of suspension of the catamenia which attends pregnancy, a copious discharge of water and blood, or of water slightly tinged with blood, resembling red-currant juice. This occurs at irregular intervals, and in variable quantities. The watery discharge is accompanied by pains, and appears to be caused by the breaking down of numbers of the larger hydatids. These symptoms are sufficient, in most cases, to make the nature of the affection plain. In a suspected case, the discharges should be carefully examined, and, of course, the detection of a single hydatid, or of a portion of an hydatid, renders the diagnosis certain. Little information is acquired by digital examination in cases of hydatid mole, when the degenerated mass remains altogether within the uterus. But the other cases in which a discharge similar to that commonly met with in hydatids occurs, are cauliflower excrescence, and certain cases of polypus, in which the disease can readily be made out by examination. The loss of health caused by hydatids is often of the gravest character from the quantity of watery and sanguineous discharge. Owing to the extensive attachment of the hydatid mass, its separation is sometimes attended by flooding equal to that met with in placenta prævia. Profound anæmia, failure of the heart's action, dropsical swellings, and even paralysis, have occurred in the course of this disease. Sometimes, masses of hydatids are discharged from time to time; but a portion of the diseased structure being left behind, the growth goes on afresh, and reduces the patient to the greatest extremity of weakness. Two or three washhand-basinfuls of hydatids have been expelled from the uterus at once in some cases.

The moles occurring later in pregnancy, or those in which simple shrinking of the fœtus and degeneration of the placenta occur, have their special symptoms, and may, with care, be recognised by the attendant during their progress. As in the other forms of mole, there is a recession of the ordinary signs of pregnancy. There is also an arrest of increase, and a positive diminution of size in the abdomen. The auscultatory signs of the living fœtus are altogether wanting. Either quickening does not occur, or after having been felt, the movements of the child cease. Peristaltic actions of the uterus may occur, but these can readily be distinguished from the movements of the fœtus. Hæmorrhage is generally present as the degeneration of the placenta, and its partial separation from the uterus, goes on. The loss of blood may be constant, and slight; or it may occur occasionally, and to a considerable extent. This depends on the successive separation of portions of the placenta in consequence of disease, and the irregular contractions of the uterus. In this form of retained ovum, as well as in the fleshy mole, there is frequently a disagreeable discharge, and the health of the patient becomes greatly deteriorated by the irritation of the dead mass, the loss of blood, and the poisoning of the circulation by the absorption of fœtid material.

The treatment of molar pregnancy consists in emptying the uterus of its diseased burden, and in supporting the strength of the patient, and warding off accidents while the mass remains *in utero*. In the carneous moles of small or moderate size, active treatment is very much impeded by the uncertainty of diagnosis. If in a case of suspected molar pregnancy the life of the mother should be threatened, the ovum should be detached by a catheter or the uterine sound, without hesitation. The ergot of rye may be given, with a view to the arrest of bleeding and the excitement of uterine contractions; but in ordinary cases we are obliged to wait, as in abortion, until the ovum presents at the os uteri, or can be reached with the finger, before we attempt to remove it. If the diagnosis of this form of molar pregnancy should become, as we may hope it will, more perfect and certain than it now is, we might separate the ovum by the sound, detach the os and cervix by sponge-tents, or excite the uterus by galvanism. In the case of hydatid degeneration the treatment is more positive. It is usual in such cases to give the ergot of rye to induce uterine contraction. If the os uteri is dilatable, we may introduce the hand, and detach the hydatid mass. Dr. Gunning Bedford relates the case of a woman in extreme danger from loss of blood, in which he broke down the hydatids with a female catheter successfully. The hydatids are sometimes attached very firmly, and I once saw a case in which the uterus had been ruptured by the violence of its contractions in expelling an hydatid mole. In the case of a retained ovum with degeneration of the placenta, the membranes should be ruptured, and the expulsion of the diseased ovum brought on, as soon as the mother's health suffers seriously, or the nature of the case becomes unmistakeable. The after-treatment of such cases is much the same as after ordinary abortion; but it must be said that the health is more injured after molar pregnancy than by the results of simple abortion.

CHAPTER XIV.

SUPER-FŒTATION.—EXTRA-UTERINE GESTATION.—MISSED LABOUR.

THE term SUPER-FŒTATION is applied to cases in which one gestation having commenced, a second supervenes upon it during the continuation of the first. We must, before approaching this curious subject, separate certain cases which simulate super-fœtation to a certain extent, but are altogether distinct from it. For instance, we referred in the last lecture to cases in which a woman may be delivered of a blighted ovum, and carry on a second fœtus to the full term; or in which a gravid woman may produce a full-grown fœtus and a shrivelled ovum at the natural time of parturition. Cases are also met with, in which a patient is delivered of two children at the same time, one of which is considerably more developed than the other. Such cases are termed retarded twins, and it is doubtful whether in the case of such twins, conceived at the same time, the retarded ovum may be retained *in utero* beyond the natural term. The instances here severally referred to, are altogether different in principle from cases of super-fœtation, inasmuch as they depend not upon a variation in the time of conception, but upon a difference in the time of development or expulsion, apart from any variation in the time of fecundation.

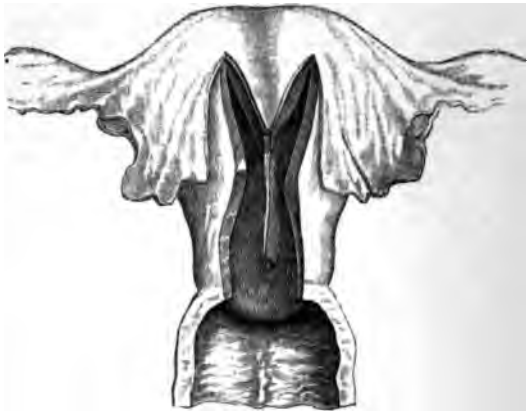
There are several conditions under which super-fœtation may take place; and as the fecundation in twin cases has an interesting relation to this subject, I may mention the chief circumstances under which twin impregnation occurs. It is probable that in many cases of twin pregnancy the second ovum has been fecundated by a coïtus occurring subsequently to the first impregnation, and such cases form the most simple instances of super-fœtation. But this is not always the case. In rare instances, in twins, the placenta is found to be single, and I would suggest that these are cases in which one ovule has contained two yolks and two germinal vesicles, just as we sometimes see in birds, one egg with a double yolk, producing two individuals. In these cases the twin impregnation must occur at the same time. More frequently the placentæ and membranes are double, but the placentæ are placed side by side, and in these cases two separate ovules have probably descended from the same ovary, and have been impregnated either at the same or at different times. In some cases the placentæ are attached to opposite sides of the fundus uteri, the inference being that the ova have descended from the two ovaria, but they may have been impregnated by a single coïtus, or otherwise. In all these cases, impregnation occurs within a short space of time, and the same preparation of the uterus serves for the twin fecundation. We have the positive proof that twin ova may be impregnated at different times, in the history of cases in which a white woman is delivered of a white and of a black child, or in which a black woman produces a black and a mulatto, at one birth. In the slave states of America cases of the latter kind are so common as to place the matter beyond doubt. Numerous authorities, including Buffon, Dewees, Dunglison, Beck, and others, testify to the facts, that a white woman married to a white man, and admitting a negro to her embraces after intercourse with her husband, may give birth to a white and a mulatto child at the same time, or that a negress, receiving a white man under similar circumstances, may produce a black and a mulatto infant. Dr. Henry, in his excellent essay on Super-fœtation, quotes a case which occurred in the Brazils, where the indigenous race is copper-coloured, but where there are negroes and whites, in which a Creole woman had three children at a birth, of three different colours—white, brown, and black, with all the features of the respective races. In animals which produce many offspring at a birth, it is not at all infrequent for the young to be the product of intercourse with different males.

Cases are on record, in which women, the subjects of extra-uterine gestation, have conceived anew, and borne children, while the extra-uterine fœtus has remained in the abdomen. M. Cliét, of Lyons, relates a case which had fallen under his own observation, in which a woman died suddenly, and upon dissection, an extra-uterine fœtus of five months was found in the abdomen, while a fœtus of three months occupied the uterus. Cases of abdominal gestation, in which the fœtus becomes enclosed in a cyst, and the woman bears other children, are less uncommon than the above. Dr. Montgomery details the particulars of an interesting case, in which two years after an extra-uterine gestation, a woman conceived, and bore three children in succession, while the extra-uterine fœtus remained encysted. Many other writers have recorded similar cases.

In another variety of super-fœtation, the uterus preserves the form met with in the lower animals, being bi-corneal or bi-corporeal, and a conception occurs first in one side of the organ, and after a time in the other. It has been observed that in cases of this kind, when one uterus has received an ovum, the other cavity develops a deciduous membrane, a circumstance which has been urged by Dr. Lee and others against the probability of the occurrence of pregnancy in a double organ at two different times. Numerous apparently unexceptionable cases are, however, on record. The museum of the University of Modena contains the uterus of a woman who died of apoplexy in 1847. This woman had borne many children, and on one occasion she became pregnant, and was delivered on the 15th of February, 1817, of a child, apparently at the full term. The abdomen diminished on one side only, after her labour, and on the 14th of March, she gave birth to a second mature child. This case was regarded at the time, by Professor Bignardi, as one of super-fœtation with double uterus, and his diagnosis was confirmed in a remarkable manner on a post-mortem examination, thirty years afterwards, by Dr. Generali. Of the authenticity of this case there can be no doubt. It may be urged that it was only a case of retained and retarded twin; but the probabilities are against such a supposition, and numerous confirmatory cases have been observed by Cassan, Voigtel, and Boivin, in which a considerably longer time occurred between the birth of the two children. It is worthy of remark, that in cases of double or divided uterus, the two portions of the organ show signs of imperfection. Abortions are very frequent in such cases, and delivery at the full term is often difficult from the imperfect action of the uterus. The term double uterus is not strictly correct, because the organ is single, but divided into two cornua. In the early condition of the human embryo, the uterus is always divided, and the so-called double uterus is merely the more or less perfect persistence of the embryonic type. Occasionally, the vagina is also double or divided.

But in addition to these forms of super-fœtation, other cases are on record, in which the uterus was proved to possess a single cavity. In one related by Professor Eisenmann, of Strasbourg, a woman was delivered of a second child 140 days after the birth of the first, both having been mature. She subsequently bore many other children, and after her death the uterus proved to be single. Unless we discredit this and similar cases recorded upon good authority, we must conclude that in addition to the fecundation of two ova at short intervals by two male parents (the occurrence of intra-uterine pregnancy after the commencement of extra-uterine gestation) and conception in a second uterus during the course of gestation in a first, pure and simple cases occur, in which, while a single uterus is occupied by one ovum, a second fecundation takes place in the same cavity, generally within the limits of the third, fourth, or fifth months of gestation. A little more than a year ago, I saw, with Mr. Eardley, of Charles-street, Westbourne-terrace, the following case:—A young married woman, pregnant for the first time, miscarried at the end of the fifth month, and some hours afterwards a small clot was discharged, enclosing a perfectly fresh and healthy ovum of about one month. There were no signs of a double uterus in this case. The patient had menstruated regularly during the time she had been pregnant, and was unwell three weeks before she aborted. She has since been delivered at the full term.

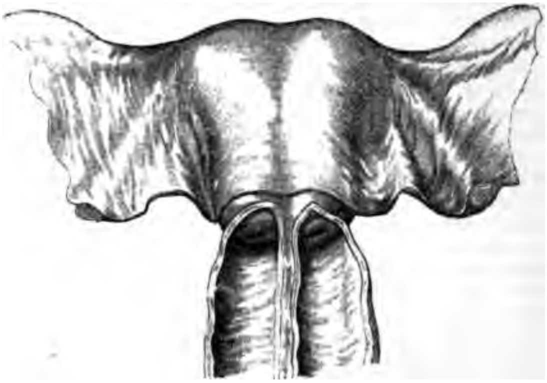
FIG. 62.



Uterus in which the cavity is divided by a septum, the vagina being single.

Many obstetric writers have combated the occurrence of genuine super-fœtation from the difficulty of explaining the occurrence of a second pregnancy while the development of an ovum is going on *in utero*, so that it may be well to say a few words upon this subject.

FIG. 63.



Bifid condition of the uterus and vagina.

Dr. Fleetwood Churchill is of opinion that the difficulties in the way of receiving the theory of super-fœtation are almost insurmountable. He considers the deciduous membrane to be a shut sac covering the orifices of the os uteri and Fallopian tubes, and that the plug of tenacious mucus secreted by the cervical canal, as well as the mechanical arrangement of the decidua, apparently render it physically impossible that the spermatozoa and the ovule can come in contact. Dr. Ramsbotham considers it impossible to suppose that a second impregnation can occur while the uterus is occupied with another ovum, and that the mucous plug of the cervix, and the decidual lining of the uterus, "would prevent the possibility of a fresh conception taking place." Many other obstetricians agree with these excellent authorities.

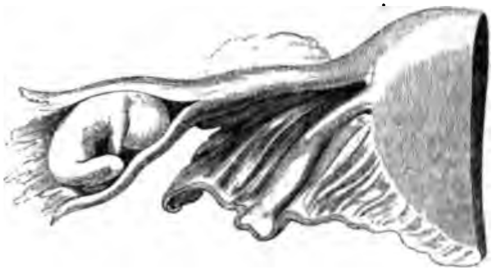
It can, however, be shown that there is no positive physical obstacle to the occurrence of super-fœtation in the mechanical closure of the canal of the cervix uteri, or the uterine apertures of the Fallopian tubes, by mucus and decidua. I have, I think, demonstrated, by numerous microscopical examinations, that the mucous plug of pregnancy is in no respect different, except in quantity, from the mucus found in the cervix in the unimpregnated state, and through which the active spermatozoa must make their way in ordinary fecundation. The mucous plug is, in fact, similar to the secretion formed by the prostate as the medium for containing the spermatic particles. As regards the difficulty presented by the decidua at the os uteri internum and the uterine apertures of the Fallopian tubes, William Hunter taught that the decidua was perforated at these points—namely, the upper part of the cervix and the tubal orifices, and no one has ever shown to the contrary. I have seen numerous preparations which prove that in early pregnancy the decidua stops short at the upper part of the cervix, leaving an opening into the canal of the cervix, and that the two apertures of the Fallopian tubes are distinctly pervious from the uterus. In the first three months the ovum consists of a bag which is only attached to one portion of the parietes of the uterus, leaving the cavity between the decidua vera and reflexa perfectly free. Professor Simpson and Dr. Matthews Duncan have pointed out that in this way the communication between the vagina and the ovary may be free for a certain time after the commencement of gestation. Thus, with the exception of the mucous plug, there is no mechanical impediment between the os uteri and the ovaria, and we have seen that the cervical mucus forms no insuperable obstacle to the ascent of spermatozoa. Super-fœtation, then, cannot be denied from the presumed impossibility of its occurrence. As the bag of the ovum increases in size, so as to occupy the whole of the fundus uteri, the mouths of the tubes are pressed upon by the ovum, but the cervical orifice remains open, with the exception of the mucous plug, until the end of gestation, except in placenta prævia. The infrequency of super-fœtation probably depends more upon the absence of perfect ovulation during pregnancy, than upon any positive mechanical impediment to the ascent of the spermatozoa, or the incapacity of the decidua vera to receive a second ovum.

The ovum may be impregnated, and become attached and developed, at any point between the upper part of the cervix uteri and the Graafian follicle, or it may fall into the abdominal cavity. Whenever the impregnated ovum does not enter the cavity of the body of the uterus, it is called Extra-Uterine Gestation. The several situations in which this grave error, so to speak, of the generative functions may occur, constitute the different forms of extra-uterine pregnancy. These varieties are, the ovarian, ovario-tubal, tubal, ventral, and interstitial or parietal. In Ovarian gestation, the ovum is impregnated in, and attached to, the Graafian follicle or the external surface of the ovary. In Ovario-tubal gestation, the ovum is attached both to the ovarian and the fimbriated extremity of the Fallopian tubes; but it is probable that in the first instance the ovum adheres to one of these organs only, and becomes attached to the other during its development. In Tubal gestation, the ovum lodges in the Fallopian tube. In Ventral pregnancy, the ovum appears to miss the tube, and becomes attached to the peritoneal surface, generally amongst the convolutions of the small intestines. There is one other form of misplaced ovum, which is usually called a variety of extra-uterine gestation, although, strictly speaking, it is not extra-uterine. This, which has been made out by Breschet, is termed Interstitial or Parietal gestation. The ovum lodges near the point at which the Fallopian tube enters the uterus, and forms a nidus in the walls of the uterus itself. The ovum in these cases becomes surrounded by a layer of the muscular coat of the uterus, similar to the layer which surrounds the majority of fibrous tumours developed in the walls of the uterus. The ovum, in this form of gestation, is developed in a kind of sub-cavity, formed in the upper part of the uterus, or between the uterine layers at one of the Fallopian angles. We may compare this form of gestation in some respects to placenta prævia, in which the attachment of the ovum takes place at the os uteri internum. One or two rare cases have been observed, in which the ovum must have been developed at the very point of junction between the tube and uterus, where the placenta has occupied the uterus, while the rest of the ovum has been contained in a cyst formed by the dilated Fallopian tube.

The tubal is the most common form of extra-uterine gestation. The ovum becomes enveloped in the chorion, a decidua is formed, and a pouch is developed in the tube, the muscular fibres of the tube being increased to a considerable extent. There is, however, a briefer limit to this than to any of the other forms of extra-uterine gestation. It is seldom prolonged beyond the second or third month, at which time, either from thinning, distension, or erosion, the cystic portion of the tube is rent, and the embryo escapes. In very rare cases the tube continues to enlarge, and the embryo remains in its cyst to the end of the natural term of gestation, or even beyond this. If the ovum remains in the tube long enough, an attempt at the formation of a placenta is made, this organ being very thin and vascular, and it is at the part opposite the attachment of the placental tissue that the rupture of the tube usually takes place. Contemporaneously with the development of the embryo in the tube, a decidual membrane is developed in the uterus in many cases, though this does not occur invariably.

The symptoms of tubal pregnancy are in a great measure the symptoms of all the varieties of extra-uterine gestation. The uterus is felt to be somewhat developed, but not to the extent which obtains in intra-uterine gestation. It is high up in the pelvis, so as often to be beyond the reach of the finger, though it is sometimes lower than natural. Menstruation generally ceases, but there is an occasional sanguineous discharge from the uterus in some cases, and there is sometimes an absence of nausea and vomiting. The ordinary changes occur in the breasts. The tumour of pregnancy is felt higher up than usual, and chiefly on one side of the abdomen. Altogether, the uneasiness experienced in every variety of extra-utero-gestation is greater than in ordinary pregnancies, and often gives the patient the idea of some unnatural condition. When the tube bursts, the patient, generally without any premonition, is seized with agonizing pain, followed by ghastly pallor, fainting, hurried breathing, and fatal collapse. Cases have, however, been met with, in which little pain has attended the rupture of the tube, the symptoms being those of pure collapse. On dissection, the ovum is found in the abdomen, with a rent in the tube, and a large quantity of blood in the peritoneal cavity. At the time of the bursting of the tube, there are indications of uterine excitement, and an attempt at detaching the decidua, where this structure exists. Death is evidently caused by the loss of blood, and by the shock incident to the effusion into the peritoneum. The treatment is unhappily almost nil. Pressure and cold have been recommended. Restoratives and opiates have been given to allay pain and support the patient, but very rarely with anything beyond the most transient good effects. As, with a rare exception or two, all these cases have proved fatal; if the diagnosis were perfect, it might afford a bare chance of safety, in such a desperate conjuncture, to open the abdomen, and attempt to arrest the flow of blood by deligation of the tube.

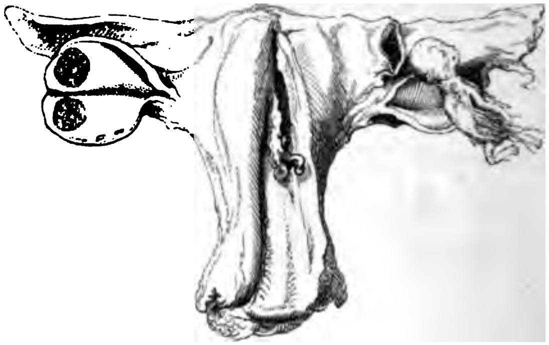
FIG. 64.



Case of tubal gestation.

Some years since, Dr. Oldham wrote to ask my opinion upon a curious circumstance which he had observed in a case of tubal gestation. It was, that the corpus luteum was found in the ovary opposite to the side on which the ovum was lodged. Three explanations suggested themselves. The unimpregnated ovule might have been swept by the cilia of the peritoneum from the right ovary to the fimbriated extremity of the left tube. This would be similar to that which occurs in the amphibia, in which the ova always traverse the abdomen to reach the oviduct. Or the left tube may have reached over to the right ovary, and have taken up the ovule. This was the opinion to which I believe Dr. Oldham and Mr. Wharton Jones inclined. According to the third explanation, it might be that the ovule had descended the right tube, entered the uterus, and then ascended through part of the left tube, by an antiperistaltic action, or by the ciliary currents which move from below upwards. My own opinion was in favour of the ovule having entered the uterus by one tube, and ascended by the other. Such cases are very interesting in relation to the causes of extra-uterine fœtation. Dr. Oldham has now collected three cases of this kind, so that they cannot be very uncommon. The following woodcut is taken from a drawing of one of Dr. Oldham's cases.

FIG. 65.



Tubal pregnancy, with the corpus luteum in the ovary of the opposite side. The decidua is represented in process of detachment from the uterine cavity.

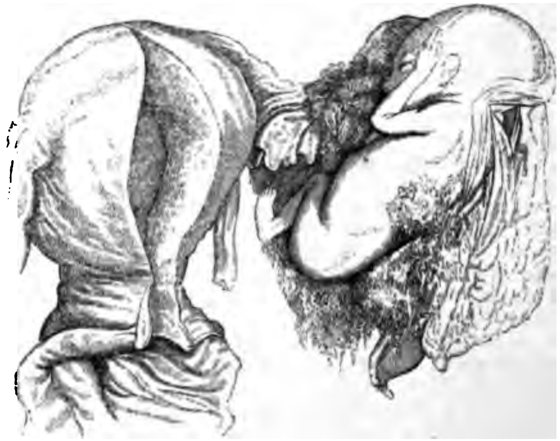
As regards the causes of extra-uterine fœtation, many hypotheses have been advanced. It is believed that there is a greater tendency to this accident in the unmarried than the married, and some curious cases are on record, in which it has happened in women who were the subject of fright or terror at the time of coïtus. In these cases emotion would seem to be a cause. In the ovarian and ovario-tubal varieties, it is suggested that inflammation of the mucous lining of the follicles, or of the indusium, or the extremities of the tubes, may have caused adhesions of the ovum, and it has been said that these forms are prone to occur in courtesans, in whom ovario-tubal inflammation and adhesion are common. In tubal gestation, there may have been large size of the ovum, feeble peristaltic action of the tube, or inflammation of the tubal mucous membrane. In ventral pregnancy, the cause would seem to be the faulty action of the tube in grasping the ovary. In the interstitial cases the ovum has been supposed to lodge in some fold or depression upon the surface of the uterus.

In ovarian pregnancy, the early symptoms are the same as in the tubal variety, but the catastrophe does not occur so early, nor does death take place with the same rapidity. The ovum is in some cases attached to the interior of the Graafian vesicle, the placenta combining with the corpus luteum, or it is seated upon the external surface of the ovary. In the former cases impregnation occurs within the mucous follicle, and the ovule probably never leaves its primary nidus. There is, as in the tubal variety, a thin placenta, and the decidua, chorion, and amnion are formed within the sac. Sometimes death happens as suddenly as in tubal gestation, from the shock and loss of blood attending the rupture of the ovary; in others, the ovarium increases in size, and the fœtus goes on to the full term, when it dies, and may be retained for a considerable period. When this happens, the case follows the course to be presently described, when treating of the termination of ventral pregnancy. In this form of extra-uterine pregnancy, a more or less perfect decidua is formed in the uterus, and there are constant and violent attacks of uterine pain, accompanied by sanguineous discharges. Of the occasional occurrence of ovarian pregnancy there can be no doubt, though it has been questioned, chiefly upon theoretical grounds, by Velpeau and others. I believe, however, that cases have been ranked in this variety in which no pregnancy of any kind existed. Even in the celebrated essay of Dr. Campbell, cases are admitted which are open to doubt. In the case of Louise Adelaide, for instance, on a post-mortem examination, a pouched tumour, occupying the situation of the left ovary, was found, containing hair, teeth, bones, and greasy matter. This may, however, have been a case of ovarian disease without impregnation, in which such structures are occasionally found. The changes in the ovary consequent upon the discharge of an ovule and the formation of a spurious corpus luteum have also, before the function of ovulation was understood, been mistaken for commencing ovarian gestation. In the undoubted cases, the entire fœtus has been found within the sac, or escaped from a perforation in the ovarian cyst. The rupture of the ovarian cyst in extra-uterine cases is generally preceded by uneasiness and pain in the tumour, and seems to be effected by an inflammatory process. In the interstitial form of gestation, the development of the fœtus usually goes on to the full term.

In ovario-tubal and ventral pregnancy, the ovum acquires its nourishment more easily than in the other cases, and the structures surrounding it yield, so that the tendency is to go on to the full term of pregnancy. The auscultatory sounds are the same as in natural pregnancy, but the limbs of the fœtus are felt with great distinctness; hardly more so, however, than in some cases of intra-uterine gestation, where the parietes of the uterus are of unusual thinness. If the cyst containing the ovum bursts, the symptoms are similar to those which occur in ovarian or tubal cases, but less severe. The accident generally happens at a later period, and the pressure of the surrounding organs appears to restrain the hæmorrhage. When rupture does not occur, the fœtus has a tendency to perish at what would be the time of parturition; uterine contractions with the expulsion of the decidua generally occur; there is a lochial discharge, and milk is secreted. The death of the fœtus is sometimes attended by violent movements and convulsions, of which the mother is sensible. These phenomena are probably the result of asphyxia, induced by the unfitness of the placenta to continue its functions. In some cases the child has been considerably larger than at the full term, and it has been supposed that it has lived one or even two months beyond the usual time. After the death of the fœtus, a process of disorganization slowly commences, the bones separate, and the soft parts become converted into adipocirous material. It may become smaller and smaller, the cyst contracting upon it, and remain for a great number of years without causing any considerable inconvenience. More frequently, however, it causes great irritation and inflammation, the residual mass attempting to make its way to the surface, or to the rectum and bladder, to be discharged. This process is attended by suppuration, hectic, colliquative sweating and diarrhœa, great suffering, and deterioration of the general health, which, spreading over a long period, very commonly destroys the life of the patient. Cases, however, occur in which perfect recovery ensues.

The treatment of such cases must be considered in relation to the time preceding and subsequent to the death of the fœtus. Dr. Campbell records nine cases of ventral pregnancy, in which gastrotomy was performed before the death of the fœtus, or shortly afterwards, and all died, probably because of the vascular connexion of the placenta with the abdominal viscera. Nature appears to be more happy in her mode of proceeding, and when the remains of the fœtus point either upon the surface of the abdomen, the vagina, bladder, or rectum, Art may step in and assist the process very efficiently. When the fœtal abscess has burst, the opening may be enlarged to allow of the extraction of the extraneous matter, consisting of a mixture of bones, fatty matter, and the remains of the placenta, which is generally converted into a soft purulent mass. Of thirty cases in which, according to Dr. Campbell, gastrotomy, or the dilatation of a breach already effected by suppuration, was practised, twenty-eight recovered. During this process, which may occupy months or even years, the strength of the patient has to be supported, abscesses dealt with, and inflammatory attacks treated as they arise. In the rare cases in which, in ventral pregnancy, the cyst presents low down in the pelvis, and the parts of the child, such as the head, hands, or feet, can be felt through the vagina, an incision through the vaginal walls into the cyst is a more favourable operation than simple gastrotomy. Dr. Campbell states that of nine cases in which incision of the vagina was performed, in three, both mothers and infants were

Fig. 66.



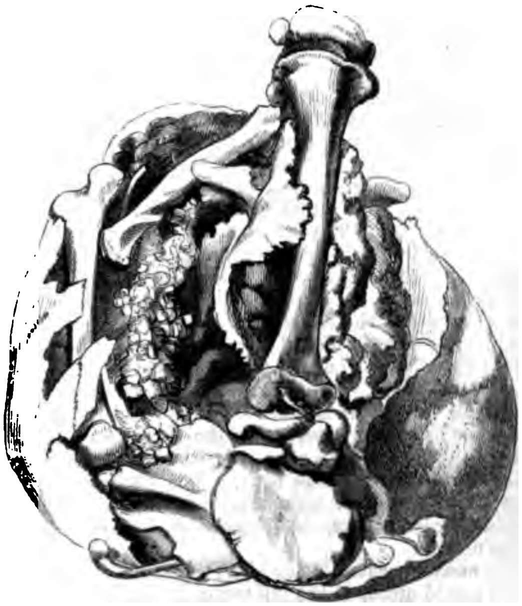
Uterus and fœtus in a case of abdominal pregnancy.

saved; in two the mothers only recovered; in one, the child alone was preserved; while in three, both mothers and children perished.

The present may be a proper place for mentioning a very curious and extraordinary obstetric and physiological phenomenon, far more rare than either super-fœtation or extra-uterine gestation, and having some relationship with both these abnormal conditions. I allude to what has been called **MISSED LABOUR**, in which the fœtus being *in utero*, parturition from some unascertained cause does not come on at the usual time, but the fœtus dies, and remains included in the uterus, without causing the immediate death of the mother. Dr. Oldham exhibited the uterus and remains of a fœtus, from a most interesting case of this kind, at the first meeting of the Pathological Society in 1846. In this case the child was felt *in utero*, the fact having been ascertained by Dr. Oldham himself, so that no error can be imagined; but parturition did not occur, nor any attempt at parturition. The child died, and became disorganized, portions of the fœtus discharging themselves or being removed through the os uteri for the course of three months from the date of the parturient nisus. At the end of this time the woman died; and on making a post-mortem examination, Dr. Oldham found the remains of the fœtus, consisting of a moulded mass of bones and adipocirous matter. This mass had apparently worn through the anterior wall of the uterus, in the same manner as an aneurism makes its way through the tissues with which it is in contact, and was contained in an imperfect cyst composed of the posterior wall of the uterus and the abdominal parietes. There had been no sign of rupture of the anterior wall of the uterus at any time. The fundus of the bladder was nearly eaten through, so that, if the woman had lived, portions of the fœtus would probably have escaped from the urethra. Dr. Simpson states that similar cases of missed labour are sometimes met with in cows and other animals, and that, as in the above case, the bones of the fœtus become moulded into a compact mass, which may remain a long time *in utero*. The following woodcut represents the residual mass removed from the cyst after death, and which is contained in the museum of Guy's Hospital. (Fig. 67.)

From the similarity of symptoms in this case to those cases of abdominal extra-uterine gestation in which the fœtus is retained, becomes encysted, and is discharged by the bladder or rectum, it seems quite possible that cases of missed labour have been sometimes mistaken for ventral pregnancy. The treatment in cases of missed labour should evidently be to excite the uterus to contraction, if possible, by galvanism or other means, when the time of labour has passed, and the child has

FIG. 67.



Contents of cyst, in Dr. Oldham's case of Missed Labour.

been ascertained to be dead, or to combine these means with attempts to break up the fœtus and extract it through the os uteri. When this time has passed by, such cases resemble ventral pregnancy, and require similar treatment. They are, however, perhaps the rarest obstetric complication that can be met with, and have not hitherto been mentioned in systematic treatises on midwifery.

CHAPTER XV.

THE GRAVID UTERUS.

THE unimpregnated, virgin, or nulliparous uterus, is from two inches and a half, to two inches and three-quarters in length, its breadth being, from tube to tube, from an inch and a half to an inch and three-quarters. At the end of gestation, the uterus is about thirteen inches long, by eight or nine in breadth; its greatest antero-posterior diameter being eight or nine inches. Levret made some calculations, according to which the superficies of the virgin uterus may be taken at sixteen inches, while, at the time of the coming on of labour, its superficies may be estimated at about three hundred and thirty-nine inches. The cavity of the unimpregnated virgin is equivalent to about three-fourths of a cubic inch; while, when fully developed, it exceeds four hundred cubic inches! The uterus, in the virgin state, weighs about an ounce; and that of a woman who has borne children, about an ounce and a half. Immediately after labour, the uterus weighs about twenty-four ounces; but this weight must be considerably exceeded when it is distended by the fœtus, and when its vessels are full of blood. These facts show the wonderful manner in which the uterus increases under the stimulus of impregnation—an increase having no physiological parallel in any other organ in the human body. This increase is divided between the muscular structure, the mucous membrane or decidua, the lymphatics, the veins and arteries, and the nerves of the organ.

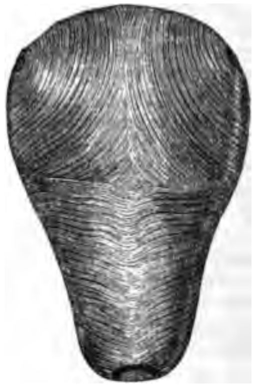
The measurements already given represent the general size of the gravid uterus at the full term; but the capacity of the uterus varies much in individual cases, chiefly from the greater or smaller quantity of the liquor amnii, or the occurrence of twins. In some cases, there is only a very small quantity of liquor amnii; and in others, there may be dropsy, and great distension of the amnion. The shape of the uterus is ovoid, but its figure is somewhat shorter, and the smaller extremity less pointed, than the perfect ovoid. The organ is more developed anteriorly than posteriorly; and it is somewhat flattened behind. It is moderately filled, but not distended, by its contents. William Hunter, whose descriptions of the gravid uterus are almost as graphic as his beautiful plates, compares it to a bladder partially filled with fluid, in consequence of which it yields to the pressure of the surrounding parts, and is, to some extent, moulded by them in shape. The gravid uterus, when filled with its contents, feels much thinner to the touch than it actually is. Its parietes are from one-third to two-thirds of an inch in thickness; but it exceeds this considerably at the site of the placenta. Occasionally, in twins, the two lateral valves of the uterus are developed in such a way as to leave a division or cleft between them; and cases are met with in which, with one fœtus, the right or left side of the organ is chiefly developed. It sometimes occurs that a particular part of the uterus does not perfectly take on the growth of normal pregnancy, so that a ridge or contracted portion remains in the interior of the organ. The ligaments of the uterus are considerably altered by the gravid state. As the organ increases in size, it expands between the folds of the broad ligaments, so that in their unfolded state these ligaments form the peritoneal covering of the sides of the uterus. As a consequence, the broad ligaments and the ovaria, though they ascend during pregnancy, are lower down in their attachment to the uterus than in the ungravid state. The Fallopian tubes and the ovaria are close to the sides of the uterus, the fimbriated extremities pointing downwards, and the broad ligaments are shortened to the greatest possible extent. The ovarian ligaments lie upon the sides of the uterus, and the round ligaments extend almost perpendicularly downwards from the fundus uteri to the inguinal rings.

The development of the decidual mucous membrane has already been described. The lymphatics of the uterus and its appendages, which were first described by Cruikshank, increase from the minute and almost invisible size, found in the virgin uterus, to the size of a goose-quill, or even larger, in the principal trunks. The lymphatic vessels pervade every part of the gravid uterus, but are especially abundant underneath the peritoneal covering. They follow the course of the hypogastric and spermatic bloodvessels, and reach the central lymphatic trunks by entering the glands of the sides of the vagina, and the iliac, sacral, and lumbar plexuses of glands. The lymphatics are, no doubt, largely concerned in the processes of the nutrition of the uterine tissues during their enormous growth, and in that removal of effete material after labour, which, in the course of five or six weeks, reduces the uterus from a pound and a half in weight, to something less than two ounces. The uterine arteries, both the hypogastrics and spermatics, greatly increase in size, particularly the hypogastrics. This increase is greater at the part of the uterus to which the placenta is attached. The uterine arteries, in ramifying in the structure of the organ, have a tendency to anastomose to such an extent as to form an arterial network; and as they plunge deeper into the substance of the uterus, they take a convoluted or spiral course. This spiral arrangement especially occurs before the vessels enter the placenta, the spirals running parallel with the decidua scrotina, and immediately beneath it, for the space of half an inch or more, before perforating the decidua to pass into the placental mass. The veins, which, in reverse, accompany the hypogastric and spermatic arteries, are still more enlarged, and form plexuses, especially in the neighbourhood of the placenta, and towards the internal surface of the uterus, of a larger extent than are found in any other veins of the body. The uterine veins do not possess valves, and some of the largest vessels are of sufficient size to admit the point of the finger. Altogether, the mass of blood contained by the arteries and veins of the uterus, in the healthy gravid organ, at full term, must be very great, and forms a considerable portion of its entire bulk. The serous or peritoneal covering of the uterus increases in thickness and extent, and but for the increased strength of the serous coat, it is probable that lacerations of the peritoneum would often occur during the contractions of the uterus in labour.

Formerly, everything was vague respecting the existence and arrangement of the muscular fibres of the uterus. The possession, even, of muscular fibres by the human uterus was argued because they could be seen in the lower animals, and because, from the functions of the uterus, they were necessarily believed to exist in this organ, rather than because they could be satisfactorily made out in dissections. In the magnificent plates of William Hunter, the external surface of the uterus presents no definite muscular arrangement. This great anatomist could find nothing but "irregularity and confusion," except upon the inner surface of the organ, where he observed the fasciculi to have in some degree the regular arrangement observed in other muscular structures. His description of the internal layer of muscular fibres is perfect even at the present day. He gives an account of the circular fasciculi surrounding the body of the uterus, and the two concentric circular planes of fibres which surround the orifices of the Fallopian tubes, and gradually blend with the circular fibres of the body of the organ. William Hunter saw the analogy between these concentric rings—the orbiculares muscles, as he terms them, of the fundus uteri and Fallopian tubes, and the circular muscles found in the two horns of the uterus in animals possessing the uterus bicornua. His words are, "The better to conceive this arrangement of the internal muscular fibres, we may suppose each corner of the fundus uteri, where the tube is inserted, to be stretched or drawn out, so as to make two horns, or a bifid uterus, as in the quadruped; then, if we understand the inner fibres to be circular in every part of the uterus, we clearly understand how they will be circular in the human uterus upon its body, and likewise circular and concentric at each corner of the fundus." Before this time, Ruysch had described the fundus uterus as possessing a single circular muscle only. Sir Charles Bell carried our knowledge of this subject a step further, and described the muscular fibres diverging from the round ligaments to spread over the whole of the organ, and he considered these ligaments as in some respects the tendons of the external fibres of the uterus. His conclusion was, that the circular fibres prevailed towards the fundus, and that the longitudinal fibres were most apparent towards the os and cervix.

According to the recent descriptions of Kölliker and other minute anatomists, who have combined the use of the scalpel with the microscope in their investigations, the gravid uterus possesses three layers of muscular fibres, all of them being of a paler colour than is found generally in other muscles. These three layers can be made out with tolerable distinctness, but not so clearly as we can make out the circular and longitudinal layers of the Fallopian tube or intestine. The internal stratum, or the inner layer of William Hunter, is thin, and composed of delicate circular and transverse fibres, the circular fibres being found chiefly in the middle of the body of the uterus, around the Fallopian tubes, and at the os uteri, in which latter position they form an imperfect sphincter. The middle layer is thick and strong, consisting of flat bundles of fibres, running in different directions, interlacing with each other, and surrounding the vessels of the uterus. These bundles of fibres are more loosely arranged than those of the internal layer, giving the middle portion of the uterine parieties a spongy appearance. This stratum is strongest at the fundus uteri, where it seems to consist of several layers. The external layer consists of transverse and longitudinal fibres, forming a thin stratum, immediately beneath, and intimately connected with, the peritoneal covering of the uterus. The longitudinal fibres are arranged chiefly upon the anterior and posterior surfaces of the organ, and extend from the fundus to the lower part of the cervix. The transverse fibres of this layer surround, or nearly so, the organ, and fibres derived from it are continued, not only into the round ligaments, but into the broad and ovarian ligaments, so as, in effect, to connect the fibrous structure of the uterus with the fibrous stroma of the ovaria. The following woodcuts show, in a diagrammatic form, the different layers of the uterine muscular fibres. (Figs. 68, 69, 70.)

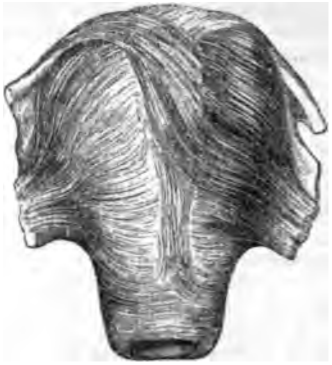
Fig. 68.



Internal layer of uterine muscular fibres.

Sir Charles Bell pointed out a fact which has been confirmed by subsequent observers—namely, that in all parts of the uterus muscular fibres are found to surround the bloodvessels, and that this is especially the case with the open vessels upon the surface from which the placenta has been detached. William Hunter had observed that at the site of the placental attachment the inner layer of muscular fibres lost its larity, and was found to be interlacing amongst the

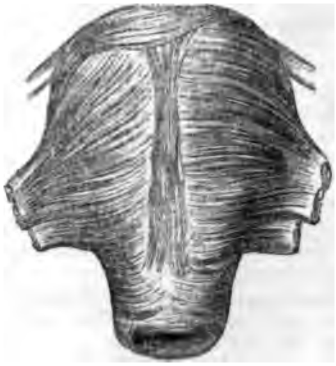
FIG. 69.



Middle layer of uterine muscular fibres.

vessels. The bearing of this arrangement upon the a hæmorrhage after the placenta has been detached is o

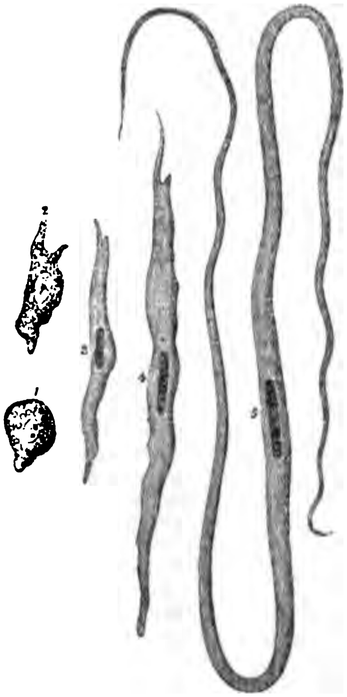
FIG. 70.



External layer of uterine muscular fibres.

no longer needed, and the uterus has to return in a comparatively short space of time from a weight of twenty-four ounces

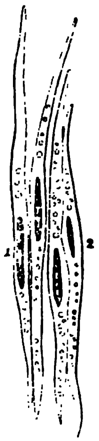
FIG. 71.



1 & 2. Embryonic nucleated fibre cells of the unimpregnated uterus. 3, 4, 5. Muscular fibre cells of the gravid uterus in different stages of development.

to one ounce and a half. The necessary Involution of the uterus is effected chiefly by the atrophy and fatty degeneration of the colossal muscular fibres, and the absorption and removal of the fatty matter by the kidneys, the mammary glands, and from the internal surface of the uterus itself. The whole uterus becomes soft; it is difficult to insulate individual fibre cells from their excessive friability, and they are found to be studded with oily particles in their interior. The disintegrated muscular fibre of the uterus, taken into the system by absorption, probably contributes to the formation of the caseous matter of the milk first secreted, and fatty elements are found in the urine at this time, and abundantly in the lochial discharge. A brief, but very excellent account of the post-partum changes occurring in the uterus has been given by Dr. West, in the thirty-fourth volume of the "Medico-Chirurgical Transactions." During the involution of the uterus after labour, chiefly, as we have seen, by the fatty degeneration of the muscular fibres, a new series of nucleated fibre cells, having the shape and size of the fibre cells of the virgin, or nulliparous uterus, is formed. Kolliker states that three weeks after parturition, the embryonic fibre cells again appear, though a longer time than this expires before the complete fatty disintegration and absorption, or discharge of the developed fibres is accomplished. Probably two or three months have elapsed before the involution of the uterus after delivery is completed. Frequently the involution, as pointed out by Dr. Simpson, is not complete, when menorrhagia is the result. In other cases the involution is excessive, the uterus becomes smaller than before the occurrence of impregnation, a state which leads to amenorrhœa, and subsequent infertility. Thus, as observed by Franz Kilian and Mr. Rainey, the highly developed muscular structure is removed, and a more lowly organized structure formed in its place, after each labour, so that the gravid uterus of each successive pregnancy is, to a great extent, a new organ. (Fig. 72.)

FIG. 72.



Muscular fibre cells a fortnight after delivery, in a state of fatty degeneration.

The uterus receives its supply of Nerves from the hypogastric, sacral, and spermatic nerves. Below the bifurcation of the aorta, we have the aortic plexus dividing into the two hypogastric nerves. The hypogastric nerve on each side forms, in its descent to the cervix uteri, the hypogastric plexus. The hypogastric plexus, when it reaches the cervix, terminates, according to the dissections of Dr. Lee, in the hypogastric ganglion. Into the outer and lower portion of the hypogastric ganglion, branches enter from the third, and sometimes from the second and fourth, sacral nerves. From this ganglion nervous fibres are distributed to the muscular structure and the internal surface of the os, cervix, and body of the uterus. Dr. Lee describes sub-peritoneal ganglia and plexuses upon the external surface of the uterus, which maintain connexion with the hypogastric ganglion below, and the spermatic ganglion and plexus above. The nerves of the virgin uterus are arranged in a serpentine form, and are always accompanied by branches of an artery and vein.

We now approach the much-vexed question of whether the nerves of the uterus increase during pregnancy or not, than which nothing has more agitated or perplexed the anatomical and obstetric world in modern times. William Hunter, arguing from analogy, suspected that the uterine nerves enlarged in the same proportion as the blood-vessels. John Hunter thought the gravid uterus independent of nervous agency, and capable of motion "within itself," and he denied that the nerves were in the slightest degree increased during pregnancy. Tiedemann was the first to publish figures of the nerves of the gravid uterus, copied from actual dissections; but his two plates, taken from a woman who died six days after delivery, represent a very sparing supply of nerves. Since this time, it has been generally assumed that the nerves of the uterus are thicker at the time of parturition than in the unimpregnated state, though some anatomists, as Lobstein, Osiander, and Longet, have either denied the existence of uterine nerves, or have limited this organ to a very scanty supply, both in the unimpregnated and gravid states. Dr. Lee, many years ago, threw himself into the investigation of this subject, and he has pursued it ever since with characteristic ardour. He has made numerous dissections, which, in his own opinion, and in that of a host of authorities who have examined his preparations, prove to demonstration that the nerves of the uterus increase to a very great extent during pregnancy. All analogy and reasoning confirm the general truth and fidelity of Dr. Lee's dissections; and the most recent investigations, by those aloof from all personal feeling, are chiefly in his favour. Remak states, as the result of his dissections, that the nerves enlarge during gestation. Kilian has made numerous researches in the lower animals, which prove that the nervous fibres, in a medullated condition, can, during pregnancy, be traced further into the substance of the uterus than at other times; while, in the unimpregnated uterus, the nervous fibres are found, even upon the surface of the uterus, in an embryonic, non-medullated state. Kölliker can see no impossibility in the multiplication of ganglion cells and fibres, and in the addition of newly-formed nerve fibres as branches to other nervous fibres; or that the nerves, by a multiplication of their ultimate divisions, may ramify over larger spaces during pregnancy than at other times. That the pre-existing nervous fibres increase in width and length, and may be traced further into the interior of the uterus in the gravid organ than at other times, Kölliker entertains no doubt. Dr. Lee believes that very shortly after labour the uterine nerves diminish in size, and return to the condition which obtains in the unimpregnated state.

Dr. Snow Beck has executed some dissections of the gravid uterus, which appear to contradict those of Dr. Lee. Dr. Beck believes that the nerves of the uterus are not by any means so large or so numerous as they appear in Dr. Lee's dissections. He considers that the nervous arrangement at the neck of the uterus should be called the pelvic plexus, instead of the hypogastric ganglion; and that the sacral nerves do not enter into that portion of the cervical plexus which supplies the uterus, but that they are distributed to the vagina and other parts. Dr. Beck further believes that there is no increase in the size of the nerves during pregnancy, but simply that the nerves which, in the virgin uterus, have a sinuous arrangement, become straightened during gestation. There are, it must be said, certain anatomists, having great authority, who hold with Dr. Beck that the nervous supply of the uterus is very restricted, having little relation, as regards size, with the importance of the functions it is called upon to perform. It should be said, that Dr. Lee and Dr. Beck have executed their dissections upon a different principle, which may go somewhat towards accounting for the different results at which they have arrived. Dr. Beck has, by very minute dissections, cleared the nerves of the neurilemma; while, in most of his dissections, Dr. Lee has preserved the neurilemma, as a constituent part of the nerves. But for this difference, the results of the two dissections could scarcely have been so antagonistic as they now are. With every anxiety to form a correct opinion, I think it must be said, that during the last few years, the new evidence which has been brought to bear upon this important subject has been very greatly in Dr. Lee's favour. According to the researches of M. Robin, Dr. Heschl, and others, it is the neurilemma which chiefly enlarges during pregnancy. Dr. Lee states that his own opinions are in accordance with this view.

CHAPTER XVI.

THE NERVI-MOTOR FUNCTIONS OF THE UTERUS.

UTERINE muscular and nerve fibre have been considered in the last chapter, and we come now to the study of the motor functions performed by the gravid uterus. The developed organ is as strictly a muscle as the heart or diaphragm, and it is the chief agent by which the expulsion of the fœtus is effected. It is of immense importance that the nature of uterine muscular action should be understood, since we are obliged to take it into account in all cases of natural labour, and still more so in cases of preternatural parturition. One class of accidents during labour, of which rupture of the uterus is the type, arises from excessive uterine action; while another class of scarcely less importance, of which hæmorrhage may be regarded as an instance, depends upon deficient uterine action. The older writers pondered much upon the motor powers of the uterus, though the data upon which they reasoned were slender and imperfect. It is, however, remarkable, considering the interest of the subject, that it has not been satisfactorily discussed in any modern work upon obstetrics. The little actually known upon the subject has been almost entirely confined to works on general physiology. This has arisen, in great part, from the idea that the uterus was so unlike the general muscular system, that it could not be reduced to physiological rule. But the muscular structure of the uterus, and its dependence upon the nervous system, having been made out in recent times, it becomes necessary to study accurately the nervi-motor endowments of the gravid organ, which is certainly the largest, and as regards the perpetuation of the race, the most important muscle of the human economy.

The uterus is in relation with the Cerebral, Spinal, and

Ganglionic divisions of the nervous system, and possesses properties derived from each of these sources of motor power.

In the first place, let us consider the relation of the Cerebral system to uterine motor action, as seen in the influence of Volition and Emotion.

The uterus is withdrawn from the direct influence of Volition. The will has no direct power either to contract or to dilate this organ. Labour may take place when cerebral paralysis exists, the will being entirely in abeyance, but the uterine movements dependent on reflex action and peristaltic action remaining perfect. But though not exerting any direct influence, volition may affect the uterus indirectly. In certain cases of uterine inertia, when the contractions of the uterus have entirely ceased, voluntary efforts are sometimes sufficient to reproduce uterine contractions. Efforts at expiration, with the glottis closed, cause the abdominal muscles to compress the uterus mechanically, and this compression stimulates the uterus in the same way as manual irritation of the organ. What is called in other organs, Consensual action, may also probably be excited in the uterus, to some degree, by volition. Violent voluntary action quickens the action of the heart, and the voluntary contraction of the internal rectus muscle contracts the iris, though both the heart and the iris are removed from the direct action of volition. In a similar manner, the uterus, during parturition, is probably affected by the intense efforts at expiration and bearing-down, which accompany the pains of labour.

A very powerful influence may be exerted upon the uterus by Emotion. A fright, or any violent mental disturbance, may bring on labour prematurely, or produce abortion. During labour, any sudden emotion of the mind may increase or arrest uterine action. The different effects of hope or despair on the commencement, progress, and termination of labour, have frequently been remarked. Emotion often plays the part of Tantalus to the accoucheur. His entrance into the lying-in room may arrest the pains of labour for a time, through the influence of emotion; but if he should leave the house, they as often return with increased vigour, and terminate the labour abruptly in his absence. After delivery, the maternal emotion exerted by the sight of the infant causes the uterus to contract in a remarkable manner. Emotional, like voluntary action, is psychical in its nature, and originates in the cerebrum; but it acts upon the uterus and other parts through the spinal marrow, the great organ of physical motion. This is evident from the fact that emotional movements may occur in parts which are entirely paralysed to cerebral voluntary motion.

Let us now refer to the forms of uterine action depending upon the Spinal Marrow, a subject which did not admit of comprehension before the beautiful discovery of the Spinal or Diastaltic System by Dr. Marshall Hall.

The Reflex Spinal or Diastaltic action of the uterus is excited in various modes; and it is upon this form of contraction, aided by peristaltic action, and the extra-uterine reflex actions excited during the process, that natural parturition essentially depends. Contraction of the uterus, of a reflex or diastaltic kind, may be excited by irritation of the mammæ, as in the act of suckling the infant; by the impression of cold upon the vulva or abdominal surface; by irritation of the rectum, as by a stimulating enema; by gastric irritation, as in drinking a gulp of cold water, or swallowing a piece of ice; by ovarian excitement, as in the occurrence of abortion from the menstrual nidus; by irritation of the vagina or pressure on the perinæum; and by irritation of the os and cervix uteri. These facts supply the proof that the uterus is endowed with reflex action, and that the motor nerves of the uterus are in relation with the mammary, pubic, rectal, pneumo-gastric, ovarian, and vaginal nerves, and the nerves of the os and cervix uteri, as incident excitor nerves. There can be no doubt that in an organ thus subject to reflex action, its own nerves are excitors, and that in all contractions of the uterus excited by irritation of the internal surface of the uterus or of the os and cervix during the passage of the fœtus, the uterine actions are both reflex and peristaltic. That the internal surface of the uterus possesses incident spinal nerves, is proved by the occurrence of vomiting, &c., from uterine irritation. There is indeed no instance of a mucous surface wanting the power of exciting reflex action in other parts of the body. It is a question if any pure spinal fibres reach or proceed from the uterus, unmixed with fibres from the ganglionic. This admixture produces a curious effect upon the reflex contractions of the organ. If we irritate the conjunctiva with a feather, the orbicularis muscle contracts instantly. If we tickle the fauces, efforts at vomiting are immediately produced. But in the case of the uterus, contraction does not follow upon the irritation in so sudden a manner. I have sometimes, in cases of alarming hæmorrhage, had my hand in the uterus for a considerable time, and have carefully watched the influence of reflex stimuli upon the uterus. If, while the uterus remains flaccid, cold water is sprinkled upon the face, the uterus does not act at once, but after an interval of half a minute to a minute, or even longer, the organ slowly begins to contract, reaches its acme by degrees, and as slowly relaxes. The same thing happens if, while the hand remains *in utero*, cold or iced water be injected into the cavity of the organ.

As a motor organ, the uterus stands alone in many respects. Unlike the rectum and bladder, it is not directly influenced by volition; and, unlike the heart, it is extremely prone to reflex action. It more nearly resembles the œsophagus, which is uninfluenced by the will, but is endowed with reflex motion and peristaltic action. It differs, however, from the œsophagus in the number of excitor surfaces with which the spinal system places it in relation. There is no other organ—not even the stomach—which can be excited by so many distinct organs, or which acts as such an extensive excitor of motor action in other parts, both in the impregnated and unimpregnated states, as the uterus.

Besides the reflex action of the spinal marrow, and its system of excitor and motor nerves, there is the Direct action of the spinal centre to be considered, though this form of spinal action does not play the important part assigned to it by Serres, Brachet, and Segalas. In what is termed Direct or Centric spinal action, the spinal centre with its motor nerves are concerned, to the exclusion of the incident or excitor nerves. Various instances of Centric spinal action may be given. Thus, ergotine passing into the blood, affects the spinal centre, and its effects reach the uterus by its motor nerves. Other oxytoxic agents, such as strychnia, carbonic acid, savin, aloes, alcohol, the biborate of soda, and probably ipecacuanha, act in a similar manner. The state of the circulation affects the spinal centre in a very distinct manner. It is well known that there is one form of puerperal convulsion depending upon hæmorrhage, where the heart and great vessels have been nearly emptied of blood, and another caused by fulness of circulation. The convulsion probably depends greatly upon the influence of deficiency or excess of blood in the vessels of the nervous centres. Want or excess of blood, or materies morbi in the circulation, act, then, as direct stimuli to the spinal centre, and in this way the state of the circulation affects the uterus during labour. The uterus acts with increased force when the circulation is either plethoric or anæmic; though, in the latter case, exhaustion of its nervous energy quickly ensues.

We now come to the consideration of the Peristaltic or Ganglionic motor actions of the uterus.

When any part of a muscular organ supplied in whole or in part by the ganglionic system of nerves is irritated, the contraction which ensues generally spreads in a vermicular manner to a distance from the point of irritation, and continues for some time after the exciting cause is removed. This is called Peristaltic motion or action. The uterus is eminently endowed with this peristaltic form of contraction. When one point of the uterus is stimulated, through the abdominal parietes, or by the introduction of the hand into the uterus, the contraction excited extends to the whole organ. Harvey described this peristaltic action of the uterus in the doe. William Hunter saw it in the cat and the rabbit. Müller observed it in the uterus of the rat and the oviduct of the turtle; and I have seen it in the uterus of the guinea-pig and other animals. The heart, œsophagus, and intestine may be excited to contraction after death; and I have seen the uterus and vagina of the rabbit contract rhythmically, when irritated, for several hours after the cessation of respiration. Many cases are on record in which women have died undelivered, but the child has been expelled spontaneously after death. In one case, a woman dying during labour was placed in a coffin, and the fœtus was found the next day perfectly expelled. This post-mortem parturition most generally depends either upon peristaltic action, commencing after the occurrence of somatic death, or upon the rigor mortis affecting the uterus. It is well known that the rigor mortis affects the other involuntary muscles, and especially the heart, which is contracted by this influence to such an extent as to empty the ventricles, and even to simulate concentric hypertrophy. Cases are related in which the fœtus has apparently been expelled some days after the death of the mother by the gaseous distension of the abdomen; but these are different from cases occurring shortly after death, and before decomposition has set in. In the living subject, the peristaltic action of the uterus is the basis of the other uterine actions. In natural labour it is combined with reflex uterine action, and with various forms of extra-uterine action; but, under certain circumstances, it appears able to effect the expulsion of the child without other aid. In paraplegia from disease of the lower part of the spinal marrow, or in animals reduced to the same state by experiment, the peristaltic action is the chief power remaining to the uterus. In such case, delivery has been effected in an imperfect manner by the peristaltic action of the uterus, or the application of galvanism to the organ. It is not, however, known how much of the spinal marrow must be destroyed before the reflex or diastaltic actions of the uterus cease.

In the lower animals the *vagina*, rather than the uterus, is the great organ of parturition. I have many times watched this in experiments on animals which bring forth several young at a birth. The function of the cornua of the uterus, which are thin and feeble compared with the human uterus, is to bring the fœtuses successively to the os uteri, where they are grasped by the thick muscular vagina and expelled without further aid from the uterus. This action of the vagina is very distinctly peristaltic, and remains in full force for some time after death.

Experiments have been performed by various physiologists, with a view to determine the nature of uterine action. M. Serres found that on dividing the spinal cord in gravid animals before the time of parturition, death ensued at variable intervals, but abortion did not necessarily occur. He then divided the cord in animals after the commencement of parturition, and the process was arrested. In other experiments, he excited abortion in animals by irritating the spinal marrow in the lumbar region. M. Brachet divided the cord in guinea-pigs between the twelfth and thirteenth dorsal vertebræ, after the commencement of labour, and everything but feeble contractions of the uterus were arrested, the animals dying in a few days undelivered. M. Segalas made a section of the cord high up without influencing the uterus; but the organ was paralysed when the division was practised low down. Cases are detailed by MM. Brachet and Ollivier, as occurring in the human subject, in which, in paralysis depending upon disease high up in the spinal marrow, uterine action was not interfered with, but was diminished or suspended altogether in cases of paraplegia, the result of injury or disease, low down in the cord. Dr. Simpson has, I have understood, performed some experiments upon pigs which go to negative the experiments of MM. Serres, Brachet, and Segalas. In Dr. Simpson's experiments, which have not been published, parturition is said to have occurred notwithstanding the destruction of the lower portion of the spinal marrow. If Dr. Simpson's results are as I have stated, they will not prove the independence of the uterus of reflex action, since from the connexions of the greater and lesser splanchnic nerves and the thoracic, abdominal, and pelvic plexuses and ganglia, it is quite possible that the uterus may receive spinal motor fibres from the upper part of the spinal marrow.

In the case of reflex contraction of the uterus excited by irritation of the trifacial or the pneumo-gastric nerves, the medulla oblongata must be the centre of the reflex arc, and the motor influence may reach the uterus through the spinal fibres of the splanchnic nerves, without the agency of the lower part of the spinal cord. In progressive destruction of the spinal marrow from below upwards, the animal would probably die, from failure of respiration or shock, before the reflex function of the uterus was annihilated. I have in the preceding page alluded to the difference between the respective influence of the uterus and the vagina in the lower animals and in the human female.

The direction taken by the peristaltic action is of considerable importance. Professor Müller, Michaelis, and Wigand, teach that uterine contraction commences at the cervix, and travels towards the fundus, returning thence towards the os uteri. This is thought by Michaelis to prevent prolapsus of the umbilical cord, and the descent of the arms of the fœtus before the head; the cord and the arm, when lying low in the uterus, being swept upwards, beyond the risk of danger, at the commencement of every pain. Wigand considers the direction of the contraction to be proved by the phenomena attending a labour-pain. At first the os uteri grows tense, the head or presenting part recedes from the touch, and the bladder of membranes protrudes; after this, the fundus uteri becomes hard, and the presenting part of the child begins to advance. I believe this view of Wigand, which has been particularly insisted upon by Dr. Rigby, to be a very accurate description of the direction in which the uterus contracts during a labour pain.

If, as is most probable, the peristaltic action of the uterus does take this course, it is not singular, for, according to the observations of Magendie, the contents of the stomach are, during digestion, passed through the pylorus by a peristaltic movement, which begins at the pylorus, proceeds to the cardia, and then sweeps back again from left to right. Müller also describes the contraction of the heart of the frog as commencing in the venous trunks; then descending, in succession, to the auricles and ventricles; and then affecting the bulbus aortæ. The peristaltic action commences at the auricle, travels to the apex, and then returns towards the base of the ventricle. There seem good reasons for the commencement of the peristaltic action at the cervix in the human subject, in the necessity which exists for some provision against prolapsus of the cord, and arm-presentations; and still more, from the great probability that, if contractions commenced at the fundus uteri, inversion of the organ would be a frequent accident.

In addition to the divers forms of uterine Contraction, the Dilatation of the os and cervix uteri remain to be considered. The dilatation of the os uteri is, in part, mechanical or passive, depending on the contraction of the longitudinal fibres of the body of the uterus, which tend to pull the os uteri open, and also on the fluid pressure exerted by the liquor amnii on the advancing head of the fœtus. But, in addition to the mechanical distension, the os uteri is in part opened by an active mechanical dilatation. The presence of a power of dilatation in the os uteri is not more remarkable than its power of contraction after the completion of labour. We have seen that the os uteri contains numerous fibres arranged in a circular form. But the muscular fibres of the uterus, though of considerable length, do not at any point surround the organ, either in the body or at the os or cervix. This circular arrangement of the fibres, without the existence of single fibres sufficiently long to surround the os uteri, accounts for its power of contraction and dilatation. Before the commencement of labour in primipara, the os uteri is quite closed; while in parturition it is dilated to such an extent as to permit the passage of the child's head—a mass whose shortest diameter is three inches and a half, making the line of the circle necessary for its passage nearly eleven inches. This is a dilatation far exceeding that required in the action of any of the recognised sphincters, and we cannot but believe that if completely circular fibres existed at the os uteri, laceration would be inevitable.

Some of the physiological proofs of the possession of dilatile and contractile powers by the os and cervix uteri may be enumerated, and these proofs are not less convincing than the most certain anatomical evidence. In the first place, if the fibres of the cervix contracted with the same force as the fibres in the rest of the uterus, this organ could scarcely be emptied of its contents. Doubtless the contractions of the body and fundus uteri are strong, their bearing upon the cervix powerful, and the amniotic bag admirably adapted for mechanical distension; but it must be remembered that the short fibres of the cervix act at a great mechanical advantage, as compared with the fibres in any other district of the uterus. Let any one who supposes the body and the fundus may forcibly overcome a contracted state of the os and cervix, consider that the united power of all the respiratory muscles is insufficient to force the small muscles which close the glottis. The nature of the hæmorrhage in placenta prævia, as compared with hæmorrhage from the fundus, affords a strong argument in favour of a positive dilatation of the os uteri. In hæmorrhage from the fundus, the loss of blood is arrested during a pain, because the fundus is in a state of contraction; in hæmorrhage from the os and cervix, the flow is increased at each return of the pains, because the cervix is in a state of dilatation. If the dilatation were merely a mechanical distension, the pressure which dilated the os uteri would arrest the hæmorrhage at the same time.

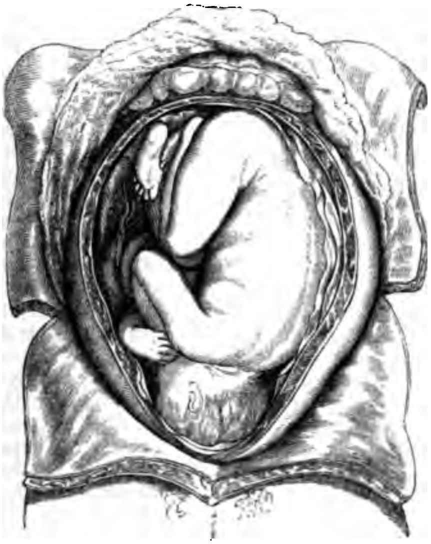
Owing to the mixed mechanical and muscular dilatation of the os uteri, it generally opens slowly; cases, however, occur in which, after long-continued rigidity, it dilates so suddenly, that even from this fact alone it is impossible to consider the dilatation as a mere mechanical distension. But the strongest physiological proof of the existence of muscular power in the os and cervix uteri is the forcible contraction which sometimes occurs after full dilatation—as, for instance, in cases of encysted placenta, in which the fingers can only be introduced with the greatest difficulty; and again, in inversio uteri, where the speedy and powerful contraction of the cervix is one of the elements of the accidents most opposed to the reposition of the organ.

CHAPTER XVII.

THE FŒTUS IN UTERO.

It was an antiquated and fanciful notion, that the fœtus sat upright *in utero*, rubbing its head against the maternal stomach, so as to cause heartburn; and it was supposed that the larger quantity of hair in boys caused a greater amount of heartburn than occurred with female children. Even as late as the time of Sir Fielding Oulde, in the middle of the last century, it was believed that the head of the fœtus was uppermost until the time of the coming on of labour. Although modern researches have shown, that in the latter part of pregnancy, in the great majority of cases, the head of the fœtus is found over the os uteri, obstetricians are not yet agreed as to the precise causes which produce this result. The mature fœtus *in utero*, and the gravid uterus, have commonly, since the time of William Hunter, been described as two ovals, the one accurately adapted to the other. Strictly speaking, the fœtus and uterus are pyriform rather than oval; but the fœtus and uterus are each composed of two oval, rather than circular, figures. In the fœtus, one oval is formed by the head, and the other by the body and limbs of the child. These parts correspond with the two ovals into which the developed cervix and the developed body of the uterus may be divided. The lower oval of the fœtus—that is to say, the head—is little compressible, while the upper and larger oval is greatly so, during the progress of labour; and thus, having in view their different degrees of compressibility, the cranial oval may be considered as the larger or more permanent of the two. Bearing these circumstances in mind, it will, however, be convenient to speak in general terms of the fœtus and uterus as ovoid. The lower end of the fœtal ovoid is formed by the vertex, the upper end by the nates. The outline of one side of the oval is formed by the occiput, the back of the neck, and the incurvated spine; the other, by the forehead and the mass of contracted limbs gathered up together. The chin is close to the sternum, the arms are crossed upon the breast, and the thighs are bent upon the trunk so that the knees approach the elbows in front of the abdomen; the legs are bent upon the thighs and decussate each other, the feet approaching the nates. The position of the extremities, particularly of the upper limbs, varies, however, in different cases. (Fig. 73.)

Fig. 73.



Attitude of the mature fœtus *in utero*.

We possess satisfactory proof that the child assumes the position with the head presenting, in the latter months of gestation, and that dead children do not assume this position with the same frequency as the living. The statistics of Dr. Collins extend to upwards of 16,000 children. In the living children, which exceeded 15,000, only 1 in 57 presented preternaturally, or otherwise than the head; while of upwards of 500 children born in a putrid state, 1 in 5 presented preternaturally. Dubois found that in births occurring before the sixth month, only 52 per cent. were head presentations; of those born during the seventh month, the head presentations increased to 68 per cent.; during the eighth and ninth months, to 76, and, at the full term, to 96 per cent. From an extended table made by Dr. Simpson from the reports of La Chapelle, Boivin, Clarke, and Collins, amounting, in the aggregate, to upwards of 84,000 cases, the proportion of cephalic presentations amounted to 96 per cent. Dubois obtained another important result similar to that deducible from the tables of Dr. Collins, by comparing the comparative frequency of cephalic presentation in dead and living children. Of children born living in the seventh month, the head presentations were in the proportion of 83 per cent.; but in dead children born during the seventh month, the proportions were reversed, no less than 55 per cent. being preternatural presentations.

The chief causes to which the general presentation of the head in living children at the full term has been referred in modern times are, Physical Gravitation, Instinctive and Voluntary movements of the fœtus, and Reflex fœtal movements.

No opinion respecting the cause of cephalic presentation has prevailed so extensively as that which referred it to Physical Gravitation. It was supposed that the weight of the head, as compared with the rest of the body, contributed to its subsidence in the waters of the amnion, and it was further believed that this tendency was increased by the insertion of the umbilical cord in such a manner as to leave the upper part of the body heavier than the lower, when suspended from the umbilicus. Dubois found, however, that in experiments in which the fœtus was suspended in a bath, or in a receptacle having the shape of the uterus, it was not the head, but the scapula or the back which first touched the bottom. This was the result in dead new-born fœtuses of various ages between the fourth and ninth month. Any argument drawn from the supposed suspension of the fœtus by the cord is evidently worthless. The length of the cord is so great as to render any suspension of the fœtus by the cord in the liquor amnii impossible. Moreover, if the cord were short, it is commonly implanted, not into the fundus, but into the side of the uterus. It is also found that twisting of the cord round the limbs or neck of the fœtus exerts no influence upon the presentation, which it should do if suspension by the cord caused the descent of the head. The drift of all fact and argument seemed, then, against the reception of gravitation as the sole cause of cephalic presentation in the fœtus.

Recently, however, Dr. Matthews Duncan has advanced some interesting facts which claim for gravitation a considerable share in determining the intra-uterine fœtal attitudes. Dr. Duncan has pointed out that when the mother is in the upright position, the fœtus lies *in utero*, at an angle of about thirty degrees with the horizon. This plane of support is formed by the glabrous internal surface of the anterior wall of the uterus, and the abdominal parietes. When the woman is lying on her back, the child is still upon an inclined plane, having a nearly similar angle. The plane is now, however, formed by the vertebral column, the abdominal viscera, and the posterior wall of the uterus. It is only when the woman lies upon either side, that the fœtus assumes the horizontal position. The greater part of the twenty-four hours is passed with the fœtus lying upon one of these planes. In the upright position, and when the woman is in constant motion, the influence of gravitation, as far as it extends, must have greater scope than during the horizontal position. The mechanical tendency of the fœtus is to slide down the plane, but this is resisted to some extent by the plane itself, and by the pelvis. This resistance, thus divided, forms the support of the fœtus and of the gravid uterus. The fœtus must be considered not as subsiding simply in water, but as sliding down a plane in an ovoid cavity surrounded by fluid. Under such circumstances, it is contended that the fœtus must have a tendency to obey the laws of gravity, and, with the restrictions mentioned, to slide down the plane. The objection to this is, that in women who preserve the horizontal position during the whole of the latter part of pregnancy, the head presents; but cases of this kind are not sufficiently numerous to found a positive argument upon them.

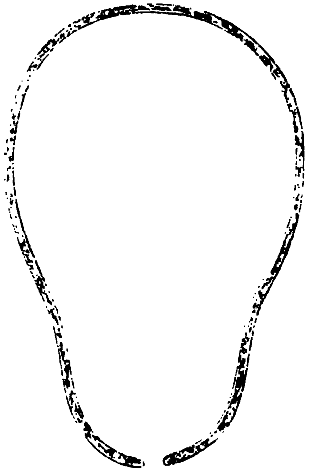
One argument used against fœtal gravitation is, that the head does not present with the same frequency in cases of hydrocephalus as in the case of the healthy fœtus. Dr. Simpson dwells upon the increased weight of the bones of the head and its contents, and shows, by a collection of such cases by Dr. Keith, as many as 1 in 6 present preternaturally, —the proportion, in ordinary cases, it will be remembered, being only 1 in 57. Dr. Duncan points out that it is the *relative* weight of the head in hydrocephalus, as compared with the density of the liquor amnii, which must be considered. Though heavier in air, it is probably more buoyant in water, than the normal fœtal head. To this it may be added that the size of the fœtal hydrocephalic head is frequently such as to render its descent into the pelvis, and its presentation at the os uteri, impossible.

But the strongest evidence against the theory of gravitation was that derived from the greater frequency of preternatural presentations in dead, as compared with living children. It was argued that the dead child ought to obey the laws of gravity as readily and accurately as the living. But it seems to have been forgotten that death may possibly alter the specific gravity of the fœtus. Dr. Duncan found, as the result of fourteen experiments, that when the healthy still-born fœtus is placed in fluid of its own specific gravity, it floats obliquely, with its head lowest, in a position corresponding to that which it maintains *in utero*. He further observed, that in cases where the child has died *in utero*, before the time of birth, changes occur which make it float with its head highest, in a fluid of its own specific gravity. This circumstance, he suggests, may have some influence in determining the frequency of malpresentations in the case of dead children; but he admits that a more extended course of experiments will be necessary before full confidence can be claimed for such results. The ingenious observations and experiments of Dr. Duncan, and the way in which he has met and controverted the objections to the recognition of fœtal gravitation as a cause of position *in utero*, must carry considerable weight. It is quite evident that gravitation cannot be omitted from the several influences which determine the natural presentations of the fœtus.

The latest exponent of the theory which refers the natural presentation of the fœtus to Instinctive and Voluntary movements on the part of the fœtus itself, is M. Paul Dubois, who wrote a very able essay upon the subject in 1832. Dubois, excluding the influence of gravitation, compared the power which leads to the assumption of the position of the fœtus with the head opposite the os uteri to the instinct which leads the bird to build its nest. He supposed that the fœtus, moved by an irresistible impulse, effects the descent of the head, so as to render it the presenting part, by a series of small volitions or spontaneous determinations, occurring during the latter part of pregnancy. The chief argument in favour of the possession by the fœtus of sensation, and possibly of volition, urged by this able obstetrician, is drawn from the harmony which he believed to exist between the movements of the fœtus and the objects which they were presumed to effect. Had he written after the reception of Dr. Marshall Hall's great discovery of the spinal or physical movements, as distinct from the cerebral or psychical motor actions of the animal economy, he would probably have referred the motor powers of the fœtus to reflex action, instead of to instinct or volition. Dr. Simpson, coming after Dubois, has taken reflex action as the clue to the fœtal movements, and has shown that we have no evidence whatever that the fœtus possesses any manifestations which may not be attributed to purely physical causes.

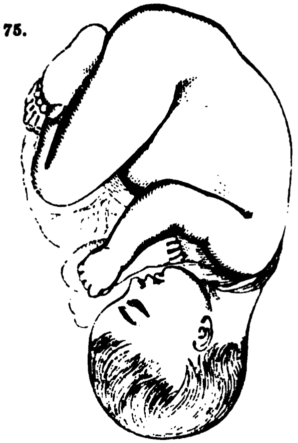
Dr. Simpson, in a series of elaborate and original papers in the "London and Edinburgh Monthly Journal" for 1849, maintains that the fœtus *in utero* is subject to a constant succession of Reflex Motor actions, which are the chief cause of cephalic presentations. Dr. Simpson recognises the ovoid outline of the uterus, and the ovoid shape of the fœtus, as greatly tending to maintain the fœtus in the uterus with the smaller end of the ovoid downwards; but he does not consider that the relations between the form of the fœtus and the form of the uterus would of themselves be sufficient to produce the position, with the head over the os uteri. He believes, on the contrary, that "the regulating vital power guiding it to the assumption of that normal position in which its figure corresponds as exactly as possible to the figure of the uterine cavity, consists of a succession of reflex or excito-motory movements of an adaptive kind on the part of the fœtus, excited by impressions made on its external surface." The physical stimuli causing these movements are referred to temporary irritations of the cutaneous surface of the fœtus by contact with the uterine walls, when the fœtus is thrown out of position by any movements or change of position on the part of the mother, such as rising or lying down, stooping, and other motions of the body. Dr. Simpson points out, that the soles of the feet, the knees and sides, parts which in the adult are marked excitors of reflex action, and which in the young child yield the sensation of tickling, are precisely the parts exposed to irritation in the fœtus. Arguing from these considerations respecting the cause of the normal presentation of the head, Dr. Simpson contends that the causes of mal-presentation are: the occurrence of labour before the reflex actions have established the natural position, the death of the fœtus—in other words, the loss of its adaptive reflex actions; and causes altering the shape of the fœtus or uterus, or physical sources of displacement, such as by hydrocephalus, monstrosities, dropsy of the amnion, uterine spasm, tumours of the uterine walls, placenta prævia, distortions of the pelvis, and accidents occurring to the mother. Finally, Dr. Simpson indicates that in the reflex movements of the fœtus lie the reasons of the rarity of positions of the fœtal head in the direct diameters of the brim of the pelvis, and their great frequency in the oblique diameters, particularly the right oblique diameter, and the greater relative frequency of occipito-anterior to that of occipito-posterior presentations. In these papers, Dr. Simpson refers to the influence of tone as moulding the form and figure of the fœtus, but he takes no account of the uterine movements in the latter part of pregnancy, and repudiates gravitation as a cause of fœtal position. Dr. Simpson illustrates his views by a series of admirable engravings, showing the outline of the uterus and the fœtus under different conditions.

FIG. 74.



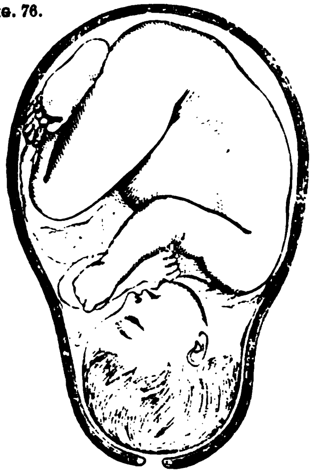
Outline of the ovoid uterus.

Fig. 75.



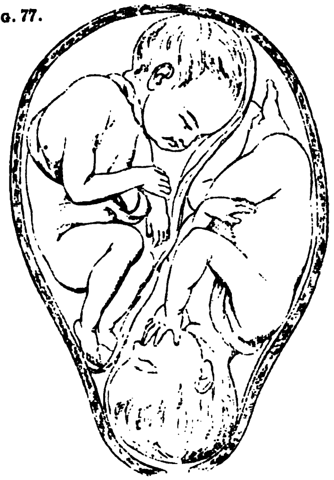
Ovoid form of fœtus at full term.

Fig. 76.



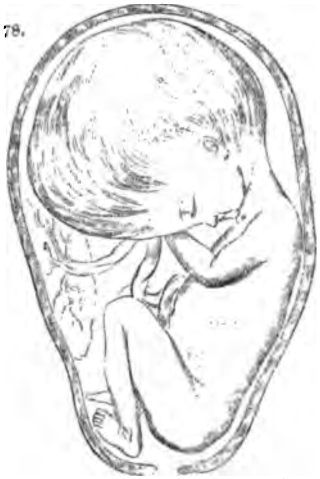
Adaptation of fœtus to uterus.

FIG. 77.



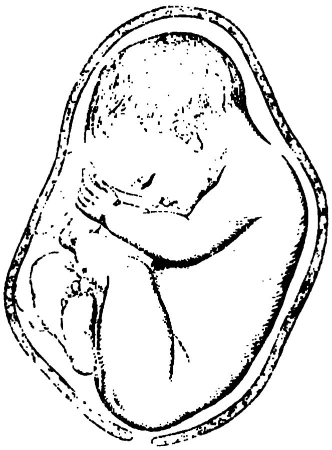
Position of twins *in utero.*

FIG. 78.



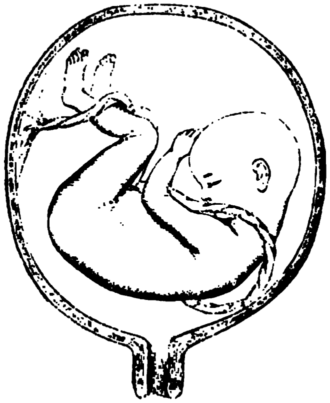
Adaptation of hydrocephalic fœtus.

Fig. 79.



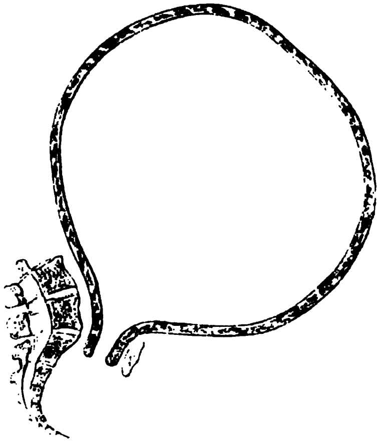
Adaptation of fœtus and uterus in breech presentation.

Fig. 80.



Fœtus and uterus at fifth month.

FIG. 81.



Form of uterus in deformed pelvis.

In my Lectures "On Parturition," published in 1848, before the appearance of Dr. Simpson's papers, while discussing the abdominal movements of pregnancy, I endeavoured to draw a distinction between the movements of the fœtus and those of the uterus. I pointed out that many of the movements commonly attributed to the fœtus really belong to the uterus. I admitted that the fœtus moved in obedience to reflex stimuli, but I supposed these reflex movements to be faint and obscure, because of the provisions which shield the fœtus from reflex excitation. I now believe I underrated the extent and influence of the fœtal movements; but after the best consideration I have been able to give the subject, I think Dr. Simpson has attributed to the reflex movements of the fœtus results, in the production of which other agencies play a very considerable part.

The ovoid shape of the fœtus, towards the end of gestation, depends in part upon the form of the uterus, and in part upon the muscular condition of the fœtus itself. As I pointed out in 1848, the fœtus *in utero* is, when unexcited and at rest, under the spinal influence of what Dr. Marshall Hall calls "Tone," or the continuous influence of the vis nervosa; that principle by which the sphincters are kept closed in after life, and which causes the contractions in limbs which are deprived of the influence of volition in cerebral paralysis. Under this influence, the stronger flexor muscles having more power than the extensors, the body of the child is slightly bent, as it is in the adult in the recumbent position when volition is at rest, as in sleep, and the arms and legs are contracted. This contracted state of the arms and legs, in the fœtus, depends upon an active condition of rigidity; and we see that, after birth, it is often difficult to straighten the limbs—their natural position—until the influence of volition has gradually acquired power, being an approach to that which obtains *in utero*. In the lower animals, the limbs, under the same influence, are straight instead of curved, the fore limbs especially being stretched out rigidly on each side of the head. This is as necessary to healthy parturition in the lower animals, as the contraction of the limbs in the human fœtus. The principle of tone, then, in the human fœtus, tends to preserve the ovoid shape of the fœtus, and it also tends to keep the child comparatively still and motionless. This continued influence of tone tends to maintain the fœtus in a passive state, and under the influence and control of the containing uterus. It is quite as important in maintaining the position of the uterus as the reflex actions are in restoring it, when this has been disturbed by change of position, &c.

In 1850, I performed some experiments with a view to determine the particular reflex movements manifested by the fœtus *in utero* under irritation. I took a rabbit nearly ready to kindle, and having placed it under chloroform, and fastened it to a table, opened the abdomen, so as to expose the uterus. I now made an incision into the uterus opposite the situation of a fœtus, so as not to wound the amnion, or to interfere with the placental attachment. In this way the fœtus was exposed in the transparent amnion without being injured in any way, the circulation in the cord not being at all interfered with. I found that when any part of the fœtus was irritated through the amnion, the fœtus would draw up its limbs, and shortly afterwards returned to the ordinary quiescent state. The one movement which constantly occurred, whether the ears, extremities, or tail were pinched, was a movement of the head, as if in respiration. The mouth was opened and shut again once or twice, in a manner similar to the movements of the mouth and head of a kitten while drowning. No liquor amnii appeared to be swallowed, and no movements of deglutition were attempted. I have repeated the experiment many times with the same result. The respiratory movement affected the whole of the upper part of the body, but no actual inspiration or expiration occurred. It appeared to me that these imperfect respiratory movements must occur with every movement of the fœtus *in utero*, and that movements of respiration do not occur, as is supposed, for the first time, after birth, but that the muscles have been exercised previously. This would account for the curious phenomena of Vagitus, in which, when air reaches the mouth of the fœtus, a cry is produced before the expulsion of the head of the child.

The supposed reflex fœtal movements of pregnancy have been felt in cases of amyelitic fœtuses, when the spinal marrow, and as a consequence, all reflex movements, are absent. I quoted in my work "On Parturition," a case of this kind from Lallemand, in which the spinal marrow was entirely wanting, but in which the supposed fœtal movements were present. Since that time two cases have been supplied to me, one by Mr. Hoadley Gabb, of Hastings, and the other by Professor Zaviziano, of Corfu, in which there was congenital absence of the brain and spinal marrow, but the intra-abdominal movements of pregnancy were profuse in both cases. I have no doubt that a great amount of the movements commonly attributed to the fœtus are in reality peristaltic movements of the uterus. I pointed out that in the state in which the fœtus exists *in utero*, constant excitation and motion would exhaust the fœtus. Professor Simpson compares the fœtus *in utero* to a decapitated frog, but the frog in this condition is speedily destroyed by excitation. I mentioned that in the common experiment of placing the hand in cold water, and then applying it to the uterus, the resulting movements must necessarily be reflex movements of the uterus, excited by the irritation of the excitor nerves of the skin, which we know happens very readily after labour. It is impossible that the influence of this cold hand could be transmitted to the fœtus through the abdominal walls, the uterus, and the liquor amnii. The same explanation applies to the movements caused by taking food or drink into the stomach, or the sensation of hunger. The movements excited by touching the feet, in footling cases, are feeble. The motions produced by lightly irritating the feet of a sleeping infant are inconsiderable, and the soles of the feet are well known to be the most excitable part of the cutaneous surface. We may observe after birth evidence that in some cases the fœtus has been quiet for some time before delivery. The legs of the fœtus may indent each other when they have lain across, or the mark of the hand is left on the side of the head. If the movements of the fœtus were so considerable as have been supposed, we should expect incessant movements during labour. I have no doubt of the frequent movement of the fœtus *in utero*, but wish to insist upon the equal or even still greater frequency of the movements of the gravid uterus itself.

No experiments can imitate, even to a tolerable degree, the conditions of the fœtus *in utero*. Suspending the mature dead fœtus in a similar fluid with the liquor amnii, when placed within a vessel having the shape of the gravid uterus, fails in many of the essential conditions belonging to the living fœtus in utero. In the early development of the embryo, the limbs are deficient in muscular power, and do not assume any definite form. The nervous system has hardly commenced its control over the as yet feeble muscles. The quantity of liquor amnii is very large in proportion to the size of the uterus, and the uterus is circular rather than ovoid in shape. We have to consider these elements as slowly altering from day to day in an almost inappreciable manner, during the middle and later months of pregnancy, and while the fœtus is gradually taking up its ultimate position. The limbs of the fœtus enlarge, becoming subject to the influence of the vis nervosa, and under the influence of tone, the arms and legs, particularly the latter, become contracted, so as to form the fœtal ovoid. During this time, the relative quantity of the liquor amnii diminishes, so that at the full term the liquor amnii scarcely does more than fill up the interstices left between the fœtus and the uterus. Synchronously with these events, the uterus itself, by the development of the cervix, changes from the circular to the pyriform or ovoid shape. With this change of shape, the uterus acquires more power of muscular contraction, and becomes the subject of reflex and peristaltic actions. The contractions of the uterus necessarily exert a moulding or adaptive influence upon the fœtus, poised lightly as it is in the liquor amnii, and moved within the limits of its prison by the slightest impetus. These causes are aided by the reflex movements of the fœtus itself. Under irritation, the limbs of the fœtus strike out, but only to return it more closely to the ovoid shape, and to accommodate it as accurately and easily as possible to the uterine cavity. All these influences, combined with the effects of gravitation and of the inclined planes upon which the fœtus rests in the upright and recumbent positions of the mother, arrange and preserve the fœtus in the normal position with the head at the os uteri. No single power, however, gives its attitude or position to the fœtus, and it is difficult, amidst such a number of adaptations, all contributing to the same end, to single out the most important. If we give the predominence to any one of them, I think the spinal principle of Tone must be considered as the most influential, and it is to the absence of this more than of any quality that we must attribute the irregular presentation of dead children.

CHAPTER XVIII.

DURATION OF PREGNANCY.

The question of the Duration of Pregnancy, involving, as it does, the Cause of the Coming-on of Labour, is one of the most interesting amongst the yet unsettled problems in Obstetrics. It is impossible to rest satisfied with the pious saying of Avicenna, that, "at the appointed time, labour comes on by the command of God," and we are impelled to attempt the penetration of a mystery, which has been the subject of numberless theories and speculations, but which has hitherto baffled all attempts at its satisfactory solution. It may be said that at the present time obstetricians and physiologists are pretty nearly divided between two opinions, as to the time of the duration of gestation, and the circumstances which influence its termination. According to one view, the uterus is excited to expel its contents by the maturity of the fœtus and its membranes. Upon the second hypothesis, the gravid uterus, like the unimpregnated organ, is ruled by the catamenial periodicity, and labour comes on at what would have been a catamenial period, had the woman remained unimpregnated. Both these ideas, in a more or less perfect form, are of very ancient date. Harvey, for instance, taught that parturition came on at the date of the tenth menstrual period after conception. Harvey's master, Fabricius, and still earlier authorities, held that labour came on in consequence of the maturity of the fœtus. In my work "On Parturition," I have adhered to the former view, and attempted to show that the ovaria are the special organs which excite the uterus to the act of parturition. While doing this, I have dwelt upon the maturity of the embryo at the time of labour, and urged it as a manifest instance of the harmony of Nature, that the fœtus should be perfectly developed, and the placenta and membranes showing signs of unfitness for their functions, at the time when the ovaria excite the uterus to expel its contents. I shall, however, proceed to state as impartially as I can the facts which support, or tell against, either theory.

The first thing which merits our attention in this inquiry is the statistical tables constructed by those who have kept registers of large numbers of cases. The late Dr. Merriman made a very careful investigation into the duration of pregnancy, which has been quoted by almost all subsequent writers upon the subject. He reckoned from, but without including, the last day of the last catamenial period, and he gives a table of 150 mature births calculated in this manner. of these,—

5 were delivered in the 37th week.
16 „ „ 38th „
21 „ „ 39th „
46 „ „ 40th „
28 „ „ 41st „
18 „ „ 42nd „
11 „ „ 43rd „

This variation is very considerable, and the question suggests itself—In the case of the fifty-seven women who carried the ovum beyond the fortieth week from the last menstruation, was the gestation protracted beyond the usual time, or was it that conception occurred one, two, or three weeks after the last catamenial appearance? To these questions we shall have to revert hereafter. Dr. Murphy has given a table of

182 cases, in which the results were somewhat different from those obtained by Dr. Merriman. In Dr. Murphy's cases, the numbers delivered in the 40th and 42nd week were equal, twenty-five in each week; while in the 41st week, thirty-two labours occurred. The late Dr. James Reid, in an elaborate essay on the Duration of Human Pregnancy, begun in 1850, and completed in "The Lancet" in 1853, gives a table of the duration of pregnancy in 500 cases, calculating from the last day of menstruation. Of these,—

23	were delivered	in the	37th week.
48	,,	,,	38th ,,
81	,,	,,	39th ,,
131	,,	,,	40th ,,
112	,,	,,	41st ,,
63	,,	,,	42nd ,,
28	,,	,,	43rd ,,
8	,,	,,	44th ,,
6	,,	,,	45th ,,
500			

These results prove, as in Dr. Merriman's table, that, calculating from the last day of the last catamenial period, considerable variations in the duration of pregnancy occur. Is there more regularity in cases where the duration of gestation, or the date of the occurrence of labour, is calculated from the time of a single coïtus? Before entering upon this topic, it must be premised, that in the case of the catamenia frequent mistakes are made by the most careful women respecting the time of its last appearance. Errors, intentional or unintentional, are still more likely to occur in fixing the time of the coïtus which has resulted in impregnation. Many of these cases occur in unmarried women, in whom there is a very constant tendency to declare that the fruitful coïtus has been a solitary one. Dr. Reid, in the paper referred to, collects forty-three instances of conception after single coïtus, all of them resting upon testimony as credible as can be obtained in such cases. The following table gives the results of Dr. Reid's inquiries upon this branch of the subject:—

260	days after single	coïtus,	delivery occurred in	1
263	"	"	"	1
264	"	"	"	2
265	"	"	"	1
266	"	"	"	2
270	"	"	"	1
271	"	"	"	2
272	"	"	"	3
273	"	"	"	1
274	"	"	"	7
275	"	"	"	2
276	"	"	"	5
278	"	"	"	1
280	"	"	"	3
283	"	"	"	
284	"	"	"	1
286	"	"	"	1
287	"	"	"	
291	"	"	"	1
293	"	"	"	2
296	"	"	"	1
300	"	"	"	1
				43

Thus it will be seen from this table that the average duration of gestation, reckoning from a single coïtus, is about 275 days. But in this mode of calculating the term of gestation, variations quite as great as those which occur in calculating from the catamenial periods, are met with. Dr. Reid, who wrote with a desire to show that the duration of pregnancy should be calculated from the time of impregnation, rather than from the last menstruation, was obliged to conclude as follows:—"If we allow of a range of from two to six days after menstruation as elapsing probably before conception takes place, it will then appear that about the thirty-ninth week after impregnation is more probably the ordinary duration of pregnancy, and this will coincide with the results of the table taken from cases of single coïtus." This means that we can calculate as well from the date of the last catamenia, as from the date of conception, but that in one case we must reckon thirty-nine, in the other forty, weeks. Upon whichever basis we make the calculation, it is proved that the duration of gestation varies considerably, within certain limits, and we must look to other evidence than that derivable from such tables, to show the real cause of the termination of pregnancy, and the occurrence of parturition. In animals, where the date of coïtus can be ascertained with greater accuracy than in the human female, still greater variations in the time between impregnation and parturition in different females of the same species are found to occur. Thus the chief facts educed from these statistical data are, that, in a large proportion of cases, gestation terminates at a certain time, within the limits of a few days, and that this time bears pretty nearly the same relation to the catamenial dates as to the dates of fruitful coition. Dr. Reid's is the largest collection of cases of conception from a single coïtus which has been made, and the result yields the 275th day as the average time for the occurrence of labour. In the calculations from the catamenial dates, Dr. Reid's cases give precisely the same result as those of Dr. Merriman, the average time of the coming on of labour being the fortieth week from the termination of the catamenia. If we get two cases of pregnancy in women in whom the catamenia appeared at the same time, the date of parturition may vary within certain limits. The same variation occurs in the cases of two females to whom impregnation occurred at the same time. If we look to the results obtained from the observations made upon comparative gestation, the same variation of the duration of pregnancy, as calculated from the date of intercourse, is found; and in animals the utmost accuracy as regards dates can be procured. Baron Tessier found that the average duration of pregnancy in 160 cows was nine months and ten days; but of this number 68 went beyond the 280th day, in 20 gestation lasted 300 days, and in 5 instances it was protracted to 305 days. The late Earl Spencer had the duration of gestation accurately noted in 764 cows. Pregnancy lasted on the average 285 days. In 8 cases only was this period exceeded by more than 12 days, and only 1 went 18 days beyond this time. These results differ somewhat from those of Tessier, but there are no grounds for questioning the accuracy of the observations in either case. Other observers have found the same variations in the gestation of the cow. Similar variations have been observed in the gestation of mares, and in elephants; and in the smaller animals, where gestation lasts a shorter time, notable variations in the time of the coming-on of parturition are found to occur. The last hypothesis respecting the variable duration of pregnancy is that advanced by Dr. Clay, of Manchester, who argues from cases which have occurred in his own practice, and the facts known respecting the duration of gestation in animals, that the younger the parent the shorter is the term of gestation. Dr. Clay believes that the ages of both parents influence the duration of pregnancy; but dwells particularly upon the influence of the mother.

In the observations of Lord Spencer, it was found that gestation with males had a tendency to continue a few days longer than gestation with females. There is a popular belief that this occurs in the case of males in the human subject. In our fishing towns, where the dates of the absence of the husband are known, it is said that when gestation is prolonged beyond the usual term, a boy is expected, and that this expectation is frequently fulfilled. Lord Spencer also found that cows in calf by a particular bull had a tendency to go a few days longer than those impregnated by other bulls of the herd.

There is a class of cases not hitherto noticed, by which the duration of pregnancy from the time of coïtus may be ascertained with considerable certainty. In 1851, Mr. Coleman, of Surbiton, drew my attention to the following circumstance:—Two ladies, patients of his, were married on the same day, and both were delivered within ten hours of each other. The marriages took place on the 7th of May, 1850, and one was confined on the afternoon of February 8th, 1851, and the other at two A.M. on the 9th, or 276 days from the date of marriage. Both had menstruated a few days before marriage. I have collected a good many cases of this kind, and they show that in the majority of those in whom labour occurs within the forty-first or forty-second week from marriage, the deliveries occur before, rather than after the 280th day from marriage. It is usual for marriages to take place shortly after a catamenial period, and the inference is, that in these cases impregnation must have occurred within a few days after marriage. Such cases may be used to confirm either the calculation from the last menstrual date, or from the fruitful coïtus. They do not, however, bear distinctly upon the determining cause of labour, and probably no mere statistics will ever settle the question. I now proceed to state the arguments in favour of the maturity of the ovum as the exciting cause of parturition.

Those who consider the maturity of the fœtus to be the cause of labour, point to the periodicity observed in the growth or flowering of plants, the separation of ripe fruit from the stalk, the leaf from the stem, the regularity with which the young of birds are hatched from the shell, the regular appearance and shedding of the teeth, and similar phenomena of growth and development, as favouring the idea that the fœtus separates from the womb, and excites the phenomena of parturition, in consequence of an inherent periodicity occurring as part of the development of the embryo. Dr. Carpenter refers to the placenta as the organ upon which the contraction of the uterus depends. He draws an argument in favour of this opinion from the phenomena of superfœtation, in which one child is detached from the uterus, a second remaining undetached, as he suggests, in consequence of the immaturity of the placenta. Dr. Simpson also has advanced the opinion, that "the loosening or decadence of the membranes and placenta from the interior of the uterus constitutes the determining cause of parturition, and that this loosening, or decadence, is itself the result of the effete degeneration of the structure of the decidua towards the full term of pregnancy."

Those who oppose the view that the catamenial dates rule the duration of pregnancy, ask why parturition should occur at the tenth rather than at the eleventh, or any other menstrual period? But this may be replied to by other questions,—Why, for instance, should the catamenial period, as the rule, consist of twenty-eight days? or why should puberty come on at a particular age? The only answer is, the fact, that these particular periodicities do occur. In animals, the periodicities of œstruation are little known, particularly in the wild state; but it is asserted that the larger animals do not œstruate sufficiently often to render it possible that in their case the duration of gestation can be a multiple of an œstrual period.

There is another point which has already been adverted to in connexion with menstruation, and which is supposed to militate against the ovarian theory of the cause of labour. As the rule, we have seen that the menstrual periodicity recurs every twenty-eight days; but in some women the period returns a day or two earlier or later than this with considerable regularity. Others are regular every fortnight, or every three weeks; or the period returns only every five or six weeks. What multiple of the catamenial periodicity is observed in such cases? I have carefully noted all the cases I have met with of this kind, and I believe that in such women the duration of pregnancy is more irregular than usual. The future collection of such cases will be very valuable in elucidating the true cause of labour, far more so than cases in which the last date of menstruation or the occurrence of a single coïtus are recorded. It is said by some who oppose the ovarian theory, that if the ovarian or catamenial periodicity ruled the coming-on of labour, the date of parturition should always be exactly 280 days from the last menstruation. This is hardly a valid objection, inasmuch as in the most regular females, the catamenia often appear a few days before, or a few days after, the expected time; yet no one on this account refuses to accept the ordinary monthly periodicity as the rule amongst women. The irregularities in the duration of gestation are certainly not greater than the irregularities observed in menstruation itself.

The argument in favour of the ovarian influence, as a determining cause of labour, and as regulating the duration of pregnancy, remains to be stated. It is allowed by all observers, that labour has a tendency to occur, and does occur, in a great proportion of cases, in the fortieth week from the last menstruation; and it is equally allowed, that impregnation is generally effected just after the catamenial period. It is also made out by the record of a considerable number of cases in which a single coïtus occurred, that gestation lasts, on an average, about 275 days from the actual date of impregnation. These data make the average duration of pregnancy approach 280 days from the last catamenial period, so that the time between the last catamenial period and the occurrence of parturition is, on the average, very nearly a multiple of a single catamenial period. This is a curious coincidence, even if it were proved that the uterine function of parturition was quite independent of the ovarian influence.

But we know that the uterus performs some of its most important functions under the influence and control of the ovaries. It is allowed, even by those who deny the influence of the ovaria upon parturition, that the catamenial function is ruled by the ovaria, that the ovarian phenomena may occur without menstruation, but that menstruation never occurs without the influence of the ovaria. It is admitted by almost, I think I may say, all, practical accoucheurs, that the influence of the ovaria are felt during pregnancy; that women suffer uneasiness at the catamenial dates, and are more liable to abort at these times than at others. This is particularly the case with women who have suffered from dysmenorrhœa previously to pregnancy. In certain cases of extra-uterine gestation, as, for instance, in abdominal pregnancy, the development of the fœtus has frequently gone on to the usual limit of pregnancy, when violent pains, as of labour, and contractions of the enlarged uterus, have come on. Dr. Ramsbotham observes on this point: "It is a curious circumstance in the history of these cases, that if the child should live till the term of gestation is completed, as soon as that time has expired, the uterus takes on itself expulsive action, which is attended with pain similar to the throes of labour; and, during these pains, the deciduous membrane is expelled from the cavity with more or less sanguineous discharge." Cases have been not unfrequently met with in which the ovum has been blighted in the middle part of pregnancy, and in which the decidua and chorion have been diseased; but the mother has carried the diseased ovum for a considerable time, or to the natural limit of gestation, when the molar or degenerated ovum has been expelled. There is another class of cases in which twin gestation is proceeding; but one ovum dies, yet the uterus is not excited to contract, but the dead and living ovum go on to the full term. In cases of superfœtation, when one living child has been born, and birth has been given to the second some time subsequently to that of the first, I have also found that there is a tendency to some multiple of the catamenial period in the interval between the birth of the two children. Dr. Fleetwood Churchill has given an account of the three most remarkable cases of superfœtation on record; and I proceed to an analysis of these cases, quoting the words of Dr. Churchill:—

"In the 'Recueil de la Société d'Emulation,' there is the case of M. A. Bigaud, of Strasburgh, aged thirty-seven, who was delivered of a living child on the 30th of April. The lochia and milk were soon suppressed. On the 17th of September of the same year (*i.e.*, about four months and a half after the first delivery) she brought forth a second apparently mature and healthy child." The first labour occurred on the last day of April, so that we have the thirty-one days of May, thirty days of June, thirty-one days each of July and August, and seventeen days in September, in all one hundred and forty days from the first to the second birth, or exactly five catamenial periods, $5 \times 28 = 140$. In a case related by Desgranges, of Lyons, to continue the account of Dr. Churchill, "the woman was delivered on the 20th of January, 1780, of a seven-months child, and on July 6th, 1780, five months and sixteen days after the former birth, she gave birth to a second, which had apparently reached its full time." In this case we have eleven days in January, twenty-nine in February (it being leap year), thirty-one in March, thirty in April, thirty-one in May, thirty in June, and six in July, between the two births, in all one hundred and sixty-eight days, or precisely six catamenial periods, 6 × 28 = 168. The third case noted by Dr. Churchill is as follows, from the account of the late Dr. Maton, in the fourth volume of the "Transactions of the College of Physicians":— "Mrs. T——, an Italian lady, but married to an Englishman, was delivered of a male child at Palermo, November 12th, 1807. On the 2nd of February, 1808, not quite three calendar months after the preceding accouchement, she was delivered of a second male infant. Dr. Maton assured Dr. Paris that 'both the children were born perfect;' the first therefore could not have been a six-months child. If we include the day on which the first child was born, the time between the births amounts to eighty-three days, or within one day of three periods of twenty-eight days: 3 × 28 = 84. In these cases it is impossible not to recognise the close adherence to the ovarian periodicity, and it is difficult to imagine this a mere coincidence. All such facts militate against the supposition that the irritation of the uterus by the mature fœtus and its membranes induces labour; and support the view that it is excited by extra-uterine and ovarian influence. There is also another class of facts which tell against this hypothesis that labour depends solely upon the maturity of the fœtus and the placenta and membranes, and as a consequence in favour of the ovarian periodicity. Instances are frequently met with in which the placenta becomes prematurely mature and caducous, or affected with degeneration, and the child dies *in utero* shortly before birth. It is well known that in certain women this happens many times in succession, the placenta becoming ripe, and positively unfit for the performance of its functions, without exciting the uterus to expel its contents. It is difficult or impossible to account for such cases on the supposition that the mature ovum excites the uterus to the efforts of labour. It is not that there is any special adhesion of the placenta and membranes to the uterus in these cases; for if the fœtus lives in a feeble condition up to the time of labour, the placenta often separates from the uterus with the first pains, and thus kills the child. On the other hand, labour comes on just as regularly in cases in which the placenta has adhered so firmly to the uterus, in consequence of inflammation, as to require mechanical detachment after labour.

In 1850, I performed some experiments, with a view to determine the possibility of exciting the uterus to contraction by irritating the ovaria. In these experiments I had the valuable aid of the late Mr. Henry Smith, the gentleman who assisted Dr. Marshall Hall in his great course of experimental inquiry. We found that in gravid rabbits chloroformed, and with the abdomen laid open; irritation of the ovaria by galvanism, a heated needle, or pinching with the forceps, excited distinct contractions of the uterus and vagina. In the rabbit at the middle period of gestation, after a few contractions of the parturient canal had been excited artificially by irritation of the ovaria, the intermittent contractions of ordinary parturition went on until the fœtuses were expelled, artificial parturition being thus excited by ovarian irritation. Berthold experimented upon animals during gestation by extirpating the ovaria, and found that this operation invariably led to abortion. I have heard that Dr. Simpson a few years ago performed some experiments with a different result from those of Berthold, but I believe these experiments have not been published. In my work already referred to, I have shown that in many of the lower animals, ovulation and œstruation are going on at the time of parturition, and that many of them admit the male, and conceive again on the same day that the uterus has been emptied.

I have thus advanced, and I believe impartially, the arguments and facts for and against the theory of the ovarian cause of labour, which I believe I was the first to propound. I have for many years taught that the ovaria, acting at or near the tenth period from the time of the ovulation which has ended in impregnation, excite in the uterus those changes which lead to the expulsion of the ovum. I have also compared the show which accompanies parturition, and the lochial discharge which follows it, to the menstrual discharge. It has appeared to me, that the changes in the uterine portion of the membranes are similar to the changes which occur in menstruation, and that the contractions of the uterus resemble those more imperfect contractions which occur in many women at the catamenial periods, and which we do not hesitate to refer to the ovaria. I believe there are some facts which do not admit of explanation upon the supposition that the cause of labour depends on the maturity of the ovum; as, for instance, the occurrence of uterine contractions at the end of gestation in cases of extra-uterine fœtation; while I believe, on the contrary, that the facts which appear to militate against the ovarian theory, do most of them admit of explanation.

In a practical point of view, we may consider that the average duration of pregnancy is about 280 days from the date of the last catamenia, or about 274 or 275 days from the time of coïtus, when this can be ascertained. As the date of fruitful intercourse can only be known in rare and exceptional cases, we are compelled in practice to date from the last catamenia—the point which, from time immemorial, has been the foundation of the calculations of women and their attendants. I constructed the Periodoscope upon the data that conception generally occurs a few days after the completion of a catamenial period, and that labour may be expected on some day of what would have been the tenth period, had pregnancy not intervened. I have now for some years used this instrument in practice, and found the results generally correct. It is at the same time a mode of calculation, and a diagram of pregnancy.

Those who calculate from the last menstruation, and those who date from conception, may equally use the periodoscope. The cases in which the date of fruitful coïtus can be known are rare, and for practical purposes the few days succeeding the last menstruation must be taken as the date of that event.

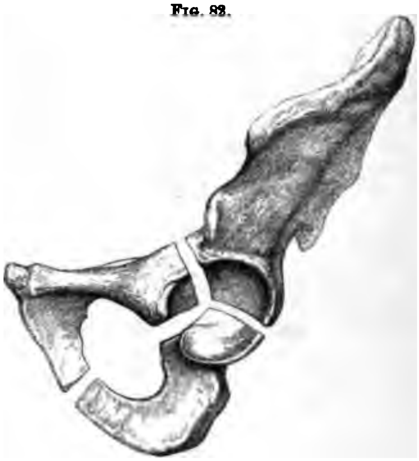
CHAPTER XIX.

THE BONES, ARTICULATIONS, AND LIGAMENTS OF THE FEMALE PELVIS.

The pelvis consists of four bones, the two Ossa Innominata, the Sacrum, and the Coccyx. In the female pelvis the last lumbar vertebra also requires to be considered in connexion with the above, as contributing to form the framework of the theatre in which the principal events of natural and morbid parturition are performed.

Up to the age of puberty each *Os Innominatum* consists of three distinct bones, the Ilium, Ischium, and Pubis, which are separated from each other at the acetabulum by cartilaginous divisions. (Fig. 82.) After this time the bones become united through the medium of a Y-shaped bony deposit. Epiphyses are also slowly formed upon the crest of the ilium, the anterior and inferior spine of the ilium, the tuberosity of the ischium, and the pubis at the symphysis. These additions increase the size of the bones which form the pelvis, and strengthen the principal points for the attachment of muscles. When the two innominate bones are placed together, they form the anterior and lateral portions of the pelvis.

Fig. 82.



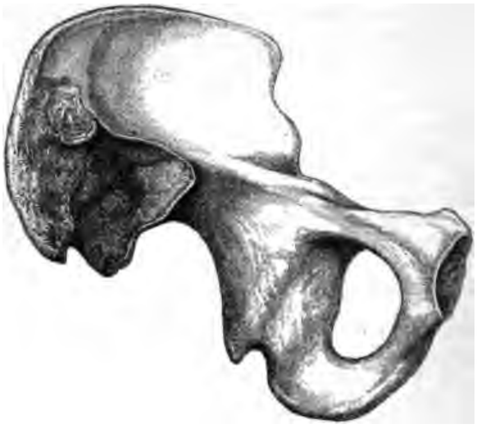
Division between the ischium, ilium, and pubis.

The obstetric points in the anatomy of the os innominatum are numerous and important, but these are of course chiefly confined to the internal surface of the bone. To the crista of the ilium the chief of the abdominal muscles concerned in labour, the internal oblique, external oblique, and transversalis are attached. Other muscles concerned in parturition are attached, the pyramidalis and the rectus abdominis to the tuberosity of the pubis; the levator ani to the pelvic portion of the pubis; and the muscles which contribute to form the perineum to the tuberosity of the ischium. The iliac fossa, covered by the iliacus internus muscle, contributes to the support of the lower segment of the gravid uterus in the latter part of pregnancy, before the head of the fœtus has descended into the pelvis. A line running from the promontory of the sacrum to the tuberosity of the pubis, the linea ilio-pectinea, forms the boundary between the true and false pelvis, or between the cavities of the pelvis and abdomen. This line also marks the greater part of the pelvic brim. At the junction of the ilium with the pubis, a prominence is met with upon the ilio-pectineal line, which is called the ilio-pectineal eminence.

The inferior and slightly everted border of the descending ramus of the pubis, forms, with its fellow of the opposite side, the arch of the pubis. Between the body and ramus of the ischium and the ascending and horizontal portions of the pubis an oval opening, the obturator foramen, is seen. The smooth inner surface of this ramus, and the smooth portion of the internal surface of the ischium, are the surfaces over which the presenting part of the fœtal head glides in parturition, and which give it its direction as it emerges under the pubic arch. The tuberosity of the ischium and the spinous process of this portion of the os innominatum contribute to form the outlet of the pelvis. Behind the spine of the ischium are seen the anterior and superior spinous processes of the ilium, between which the two sciatic foramina are formed. The whole of the three bones entering into the composition of the os innominatum contribute to form about three-fourths of the pelvic brim. (Fig. 83.)

The internal surface of the Sacrum is of great obstetric significance. It forms the posterior part of the pelvic walls, being articulated on either side with the ossa innominata. Above, it is united with the fifth lumbar vertebra, and below with the coccyx. Its upper portion forms, with the last lumbar vertebra and the inter-articular cartilage, the promontory of the sacrum, or sacro-vertebral angle, the angle being formed by the deviations of the line of the lumbar vertebræ, and the line of the upper part of the sacrum. The anterior aspect of the sacrum is smooth and concave from above downwards. The depth of the sacral curve is shown by two lines, one drawn from the promontory to the point of the sacrum, and the other at right angles from this line to the middle of the third sacral vertebra. (Fig. 84.)

Fig. 83.

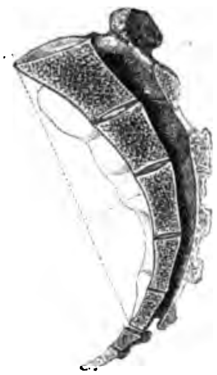


Innominatum.

From side to side, the pelvic surface is less concave, particularly at its extremities, where it is slightly convex. It is marked by four transverse lines, indicating its original division into five rudimentary vertebræ. These divisions exist, the bones being divided by cartilage and inter-vertebral matter, until after the age of puberty, when ossification begins between the lowest portions, and, ascending upwards, the bones become one osseous mass about the age of thirty. It presents on each side four inter-vertebral foramina, for the passage of the anterior branches of the sacral nerves. (Fig. 85.) Besides the great angle or promontory of the sacrum, a lesser angle is formed at the union of the sacrum and the coccyx, when the coccyx is bent backwards at the time of parturition.

The *Coccyx* generally consists of four pieces of bone articulated together until a late period of life, when they become ossified into one mass. These bones continue in the direction

FIG. 84.

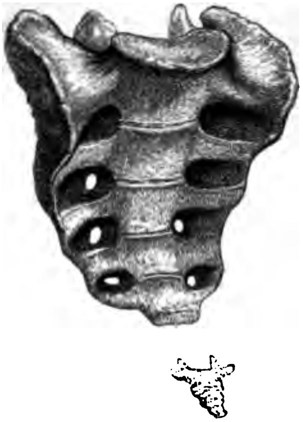


Section of sacrum and coccyx.

of the lower part of the sacral curve, so that they project downwards and forwards, their internal surface being smooth and concave. During the childbearing era the bones of the coccyx move slightly upon each other, and considerably upon the sacrum, with which the first bone is articulated. The first piece of the Coccyx is the only one presenting any marked characters. It presents above, a smooth surface, which is in apposition with the last bone of the sacrum. From the posterior and lateral sides of this surface small cornua project, which rest upon the sacral cornua. Beneath this process a small nodule, sometimes contracted into a foramen, transmits the last sacral nerve. The bones of the coccyx diminish in size from above downwards, so that the last piece is a mere nodule. Attachments exist between the coccyx and the coccygeus muscle, the levator ani, the gluteus maximus, and the sciatic ligaments on each side, and the sphincter ani at its extremity. The coccyx has the power of movement backwards and forwards to the extent of an inch. When moved forwards or elevated, it decreases the pelvic outlet; but when depressed and drawn backwards, it increases its area. This bone is moved forwards by the contraction of the levator and sphincter ani; and backwards by the contraction of the lower fibres of the gluteus maximus, when the thighs are fixed, the coccygeus, and the dilatation of the sphincter ani. The depression of the coccyx is carried, however, to its utmost point by the mechanical pressure of the fœtus as it passes the pelvic outlet.

The fifth lumbar vertebra articulates with the upper surface of the sacrum, and contributes, as already mentioned, to form its angle or promontory. This is effected by the lower surface of the last lumbar vertebra being oblique instead of flat, the anterior portion of the body being thus rendered much deeper than the posterior. (Fig. 86.) In cases of deformed pelvis this bone may become of great importance, and the other lumbar vertebræ also may have an immediate bearing upon the pelvis. Through the medium of the lumbar fascia, the lumbar vertebræ give attachment to the transversalis and the

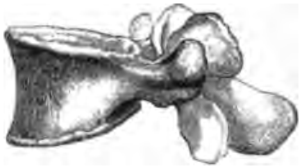
Fig. 85.



Sacrum and coccyx.

internal oblique muscles. Some anatomists consider that the fourth lumbar vertebra also forms part of the false pelvis, in ligamentous preparations, and in the living subject, because of the ligamentous connexion which exists between the transverse process and the crest of the ilium.

Fig. 86.



Fifth lumbar vertebra.

The Articulations and Ligaments which unite the bones of the pelvis, not only give the necessary strength to this part of the body, with reference to the support of the trunk and the movements of the lower extremities, but they contribute largely to render the pelvis a *cavity* fitted to contain and preserve the pelvic viscera, and a *canal* for the passage of the fœtus in parturition. The joints and articulations are so arranged that the internal surface of the pelvis is rendered smooth; but externally everything is subsidiary to strength, and numerous prominences are observed. Bony processes, ligaments, and the attachments of muscles are all made to contribute to this object. The whole pelvis may be compared to a nest, in which the rough materials are accumulated on the outside, the cavity being rendered as smooth and even as possible. The joints to be considered are the Lumbo-Sacral, Sacro-Iliac, Sacro-Coccygean, and Pubic articulations: they all belong to that class of joints termed amphi-arthrosis. The ligaments are very numerous, and connect the bones of the pelvis at other points beside those at which the bones are in articular opposition.

The vertebral surface of the sacrum articulates with the last lumbar vertebra, by means of a wedge-shaped mass of fibro-cartilage, the thickest part of the wedge being in front, and increasing the effect of the peculiar slope of the body of the last lumbar vertebra. This cartilage, which resembles in structure the inter-vertebral cartilages, really constitutes the most prominent point of the promontory of the sacrum, as it is termed. That is to say, if the finger be introduced into the vagina for the purpose of examining the capacity of the pelvis, the projecting point of the upper and posterior part of the brim is felt at the anterior part of this cartilage. The common anterior vertebral ligament passes in front of the lowest lumbar vertebræ, and extends downwards over the front of the sacrum and coccygeal bones. The transverse process of the last, and, according to some authorities, the fourth, lumbar vertebræ, are connected with the upper and external portion of the sacrum by a thick, short, and strong ligament, called the lumbo-sacral, or sacro-vertebral ligament. With the exception of this ligament, and the shape of the cartilage above described, the ligaments uniting the sacrum to the vertebral column are the same as those connecting the several vertebræ with each other.

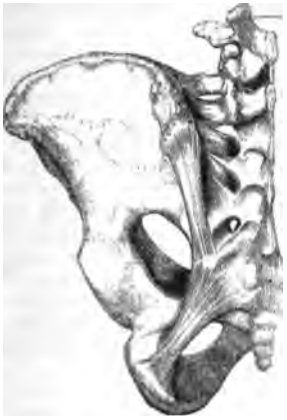
The sacro-iliac symphysis unites the articular surfaces of the sacrum and ilium, both of which are covered by a layer of cartilage presenting numerous inequalities when not in apposition. The sacral layer of cartilage is somewhat thicker than that belonging to the ilium. The union of these bones is strengthened and rendered complete by the ilio-lumbar and the anterior and posterior sacro-iliac ligaments. The ilio-lumbar extends from the transverse process of the fifth lumbar vertebra, and the back of the sacrum, to the crest of the ilium, near the posterio-superior spinous process. The anterior sacro-iliac ligament extends between the anterior surfaces of the ilium and sacrum, in the form of a thin irregular layer. The posterior sacro-iliac is stronger, consisting of several sets of fibres, extending obliquely and transversely from the rough surface of the sacrum to the posterior surface of the ilium.

The coccyx is united to the sacrum by a thin fibro-cartilaginous layer interposed between the articular surfaces of the two bones, and by an anterior and posterior ligament—the latter being of considerable thickness. The small bones of the coccyx are also joined to each other by thin plates of cartilage, and anterior and posterior ligamentous bands. Some anatomists describe the existence of small synovial sacs in cases in which these bones move more freely than usual upon each other and upon the sacrum.

The two Sacro-sciatic ligaments, great and small, require notice in this place. These unite the ilium, the sacrum, and the coccyx to the ischium, and contribute to strengthen the posterior articulations of the pelvis; but they are of more importance as a portion of the canal and outlet of the pelvis itself, than as forming part of the pelvic articulations.

The greater or posterior sacro-sciatic ligament extends from the posterior and inferior surfaces of the ilium and the posterior part of the sacrum and coccyx, to the tuberosity and ramus of the ischium. This ligament is expanded at its extremities, particularly at its posterior attachments. The small or anterior sacro-sciatic ligament extends from the side of the sacrum and coccyx to the spinous process of the ischium. At the sacro-coccygean attachment the fibres of the ligament are in apposition with the middle part of the posterior ligament; but in passing to the spinous processes, the direction of the anterior ligament crosses that of the posterior. The attachment of the anterior ligament to the sacrum and coccyx is broad, but its attachment to the spinous process is smaller, so that the whole ligament is triangular in shape. The space between the anterior and posterior ligaments and the spine and tuberosity of the ischium constitutes the small sacro-sciatic foramen; while the large sacro-sciatic foramen is formed by the sacrum and ilium, and the sacro-sciatic ligaments. The obturator-fascia ligament may be mentioned here, as being concerned in the formation of the pelvis, without any reference to its articulations. It is a fibrous membrane filling up the obturator foramen, except at the upper part, where the obturator nerves and vessels make their exit. The obturator-fascia is connected with the great sacro-sciatic ligament by the process sent up from the tuberosity of the ischium. (Fig. 87.)

FIG. 87.



Sacro-sciatic ligaments and ilio lumbar.

The symphysis pubis consists of the articular surfaces of the pubic bones, an inter-articular cartilage, anterior and posterior ligaments, and the superior, and sub-pubic, or triangular, ligaments. The inter-articular fibro-cartilage is composed of concentric lamellæ. This cartilage itself is imperfectly divided into two parts, one for each osseous surface, frequently containing a viscid pulp in the central space between them. The posterior ligament is the most indistinct; the anterior consists of numerous thick decussating fibres, which cover the symphysis. The superior pubic ligament consists of ligamentous fasciculi, which fill up the small space between the bones above the inter-articular cartilage at the upper part of the symphysis. The sub-pubic or triangular ligament is the most important. It is thick and crescent-shaped, attached to the descending rami of the pubis and the lower part of the inter-articular cartilage. Its inferior border is smooth and arched, contributing to form the angle or arch of the pubis, one of the great obstetric points of the pelvis.

With the exception of the coccyx, the movements of the bones of the pelvis upon each other in the unimpregnated state are extremely limited. Some authorities have maintained that during labour all the pelvic symphyses are relaxed to a slight extent, while others have believed that the joints remain entirely unaltered at this time. This supposition led to the now abandoned operation of Sigault, for the division of the symphysis pubis in cases of contracted pelvis. Some have even believed that during gestation osseous matter is absorbed from the pelvis and carried into the circulation to supply the wants of the fœtus. Others contend that no change whatever occurs in the bones or joints of the pelvis in the course of pregnancy and parturition. We know, however, as Denman pointed out, that in rare cases the sacro-iliac and pubic articulations become so relaxed as to cripple the subjects of this affection for a considerable time after labour. It is also known from dissections of women dying during or immediately after labour, that the cartilages of the joints of the pelvis are found to be softer and more vascular than usual at this time. Many of the lower animals are unable to support themselves firmly in the standing position previous to and during parturition, in consequence of a relaxation of the joints of the pelvis; and Mr. Robertson has pointed out that in the guinea-pig, the pubic symphysis is widely separated at the time of labour, to admit of the passage of the young. These facts afford good reasons for believing that in many cases a slight amount of relaxation of the pelvic articulations does take place in the human female during delivery. The attachments and action of the abdominal muscles are such, that during the expulsive stage of labour the outlet of the pelvis becomes slightly enlarged.

Perhaps no part of the human skeleton, rife as the whole is with adaptations, evinces more evidences of design than the bones of the female pelvis. The progress of ossification shows this in an eminent degree. Up to the time of puberty the cartilaginous division between the ilium, ischium, and pubis is complete. Under the stimulus of the ovaria, the pelvis enlarges considerably at, and previously to, the occurrence of the catamenia, and the separation of the bones which compose the pelvis greatly facilitates those operations of growth, by which its cavity is expanded to the mature standard. In the other parts of the body there is no instance of any such sudden change after the time of birth, not even in dentition, as that which occurs in the pelvis and its contained organs during the two or three years in which puberty is prepared for and completed. The development of the sterile girl into the fruitful woman is almost as striking as the metamorphoses which occur in the lower orders of creation. All the changes of this epoch have for their great object the preparation of the organism for the functions of impregnation and childbearing. Of these, the expansion of the bones of the pelvis, before the union of the three parts which compose the os innominatum, the bony deposit between the pubic bones at the symphysis pubis, the slow union of the bones of the sacrum, the formation of the numerous epiphyses which enlarge the pelvis and contribute to its strength at and before the era of puberty; and the ossific union of the different parts of the coccyx and of the whole bone with the sacrum, only after the function of childbearing has altogether ceased, are amongst the most remarkable.

CHAPTER XX.

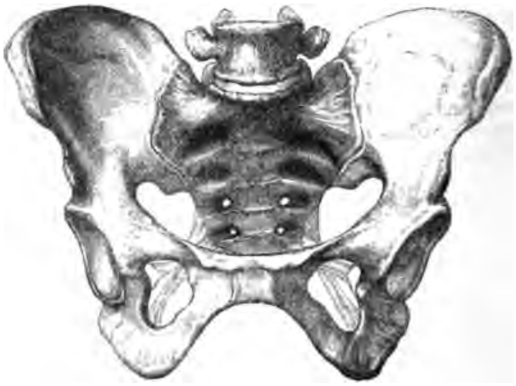
THE PELVIS.

The individual bones and ligaments which enter into the composition of the pelvis having received a detailed notice, attention will now be directed to the interior of the pelvis, and to the normal relations of the salient osseous points of its exterior anatomy. Under the first head will be included the Pelvic Planes, Axes, Angles, Diameters, and Canal, while the second will refer to certain external measurements, a knowledge of which is necessary to a ready diagnosis of special internal malformations, or general alterations of dimension and configuration. I have reserved the consideration of the pelvis to the present time, instead of introducing it into the early part of the work, in order to connect it with the anatomy of the Fœtal Head, and the Mechanism of Labour, which will form the subjects of the next two chapters.

As already stated, the pelvis is divided into two parts, a false and a true pelvis, the first situated above, and the second below, the linea ilio-pectinea. (Fig. 88.) The relations of these divisions of the whole pelvis to utero-gestation and parturition are very unequal, and in cases where the false pelvis is malformed, the distortion of the true pelvis co-exists to such an extent as to render the deviations above the brim comparatively unimportant. We must look for the interest of the false pelvis, not in its immediate relations to the passage of the fœtus through the pelvic canal, but in its functions as the supporter of certain viscera, as a fixed point for the action of numerous muscles concerned in parturition, and as a tolerably correct indicator of the condition of the true pelvis.

The true pelvis, or *bassin petit*, as it is termed by French obstetricians, is situated below the linea ilio-pectinea, which circumscribes its superior orifice or inlet, and has its inferior opening or outlet, bounded in part by osseous, and in part by ligamentous structures. In the middle line posteriorly, the outlet is formed by the coccyx, and by the great sacro-sciatic ligaments laterally and behind; the tuberosities of the ischia are its extreme lateral boundaries, and the conterminous rami of the ischia and pubes form its antero-lateral confines. The canal of the true pelvis lies between the above limits, and within this canal are situated the rectum, bladder, and ureters;

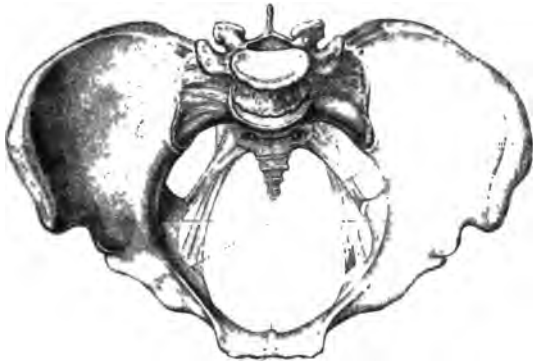
Fig. 88.



the internal iliac arteries and veins, with their subdivisions; the lymphatics; the sacral plexus in whole, and the lumbar plexus in part; and certain muscles, visceral and femoral. In the unimpregnated female, it also contains the uterus and ovaries, and during utero-gestation, a varying portion of the lower portion of the gravid uterus and its contents.

The Diameters of the pelvis are measurements taken in the three planes which have been described. The other dimensions necessary to be known are the depths of the pelvis at different points, and the distances between several of its spines and tuberosities. Beginning with the diameters of the superior plane or inlet, we have the long or transverse diameter, the antero-posterior or conjugate diameters, and the right and left oblique diameters. In the mid-plane we have the same diameters to consider, but the oblique is now the long diameter. In the inferior plane, the longest of the diameters is the antero-posterior. In referring to the statements of the most eminent authorities, an immense variety of measurements will be found, but the range of variation, with few exceptions, is not very great; and with regard to the greatest extremes, nothing is met with that does not probably result from the accidental omission or admission of very large or very small pelves into the calculation.

FIG. 89.



Brim of pelvis. Transverse, oblique, and antero-posterior diameters marked.

The depth of the pelvic cavity or canal varies greatly in different parts of the pelvis. Behind, it measures from five to six inches from the sacro-vertebral angle to the point of the coccyx; from the linea ilio-pectinea to the tuberosity of the ischium, three inches and three-quarters; and from the crest of the pubis to the pubic arch, from an inch and a half to two inches.

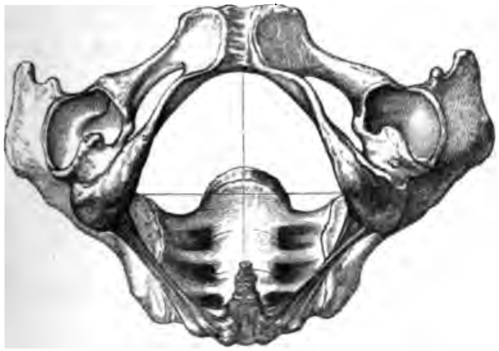
At the brim of the pelvis, the antero-posterior diameter, from the sacro-vertebral angle or promontory, to the crest of the pubis, measures four inches in the dried state. The transverse diameter measures from about four inches to five inches and a quarter. The measurement of the oblique diameter from the sacro-iliac symphysis to the ilio-pectineal eminence, is from four and a half to five inches. In the cavity of the pelvis, from the middle of the sacrum to the pubic symphysis, the antero-posterior diameter is as nearly as possible four inches and a half. The oblique diameter, from the middle of the great sacro-sciatic foramen to the obturator ligament is five inches. The transverse diameter on the same plane, between the two ischii, is about four inches and three-quarters. At the outlet or inferior strait of the pelvis, the diameters are as follow:—From the arch of the pubis to the extremity of the coccyx, antero-posterior, four inches and a half—but the mobility of the coccyx increases this by nearly an inch; between the sacro-sciatic ligament and the ascending ramus of the ischium, oblique, about five inches; between the tuberosities of the ischii, transverse, four inches. Thus, at the brim the longest diameter is the transverse, the shortest is the antero-posterior. In the middle of the pelvis, the oblique diameter is the longest, and the shortest is the antero-posterior. At the outlet, the antero-posterior is the longest, and the transverse the shortest diameter. (Fig. 90.) When the soft parts are in apposition with the bones, the oblique diameter of the brim is somewhat longer than the transverse. A line carried round the brim of the pelvis measures about fourteen inches.

An average struck from the combined observations of Duncan, Burns, Monro, Meckel, Watt, Velpeau, Moreau, Boivin, Baudelocque, Ramsbotham, Rigby, and Wood, gives us the following results:—

	Transverse.	Oblique.	Ant.-post.	
Superior plane	5·2	4·8	4·25	inches.
Middle plane	4·75	5·2	4·7	
Inferior plane	4·2	—	5·0	

It is this change in the longest diameter of the pelvis, from the transverse to the oblique, and from the oblique to the antero-posterior, which gives to the pelvis the principle of the SCREW—an idea we shall have to develop more at length when we come to the mechanism of labour.

FIG. 90.

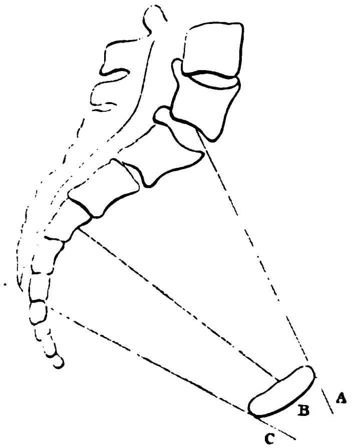


Outlet of pelvis. Antero-posterior and transverse diameters marked.

The Planes of the pelvis are imaginary levels extended between some of its corresponding points, the inclination of which to each other and to the horizon it is important to know. Only two of these planes have been generally deemed worthy of particular attention—namely, a superior and inferior plane, or plane of the inlet and outlet; but it is necessary to consider a third plane, situated between the other two, and which may be termed the mid-plane. To this plane especial study should be directed, because it is here that the rotations of the fœtal head are impressed upon it, and here, under slight deviations from the normal condition, serious obstacles to parturition are encountered. (Fig. 91.)

The plane of the inlet, or superior plane, is bounded by the linea ilio-pectinea, and is inclined to the horizon at an angle of about 60° in the female (Naëgele), and 65° in the male (Weber). That is to say, in the erect posture, and in the unimpregnated condition, these are the inclinations of the pelvic brim, inlet, or superior plane. During pregnancy, and more particularly towards the end of utero-gestation, when the weight of the gravid uterus and enlarged breasts is thrown upon the anterior arms of the levers represented by the *ossa innominata*, the obliquity of the pelvis is diminished by the

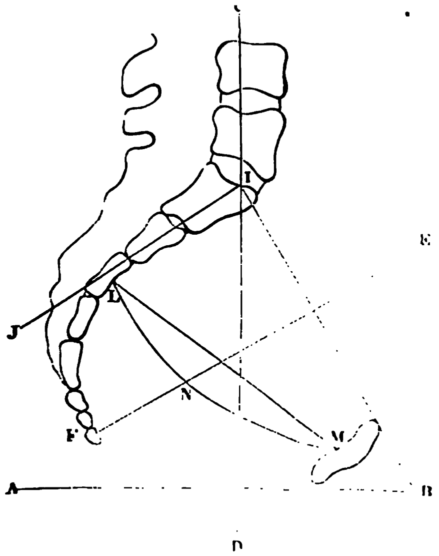
FIG. 91.



A. Plane of the outlet. B. Mid-plane. C. Plane of the outlet.

involuntary assumption of a position similar to that taken by persons in walking down a hill. The amount of diminution cannot be stated with precise accuracy, as it varies according to the length and flexibility of the spine, as well as the mobility of the sacro-iliac articulations, but it frequently amounts to several degrees. There is an evident adaptation of means to an end in the greater obliquity of the female as compared with the male pelvis, the approach of the internal surface of the symphysis pubis to the horizontal position being manifestly conducive to the support and retention of the comparatively heavy pelvic viscera of the female, and fitted to counteract the tendency to prolapse caused by the greater area of the pelvic canal. This might seem to be contradicted by the diminished obliquity which obtains during pregnancy. The gravid uterus rises, however, out of the pelvic cavity before the obliquity is materially altered, and prolapse thus becomes mechanically impossible, from the increased size and elevation of the uterus, when the ordinary provisions for support cease to be in operation. The elevation of the sacral promontory above the upper margin of the symphysis pubis, in the unimpregnated female, will of course depend partly on the obliquity of the pelvis, and partly on its dimensions. In the well-formed female pelvis, it is usually from three inches nine lines to three inches ten lines; and in the upright position, the sacral portion of the brim is a little below the antero-superior iliac spine. It is necessary to study the relations of the superior

FIG. 92.



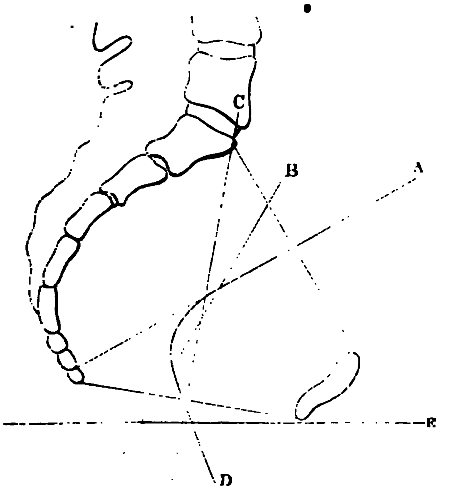
A, B. Horizon. C, D. Vertical line.
A, B, I. Angle of inclination of pelvis to horizon, equal to 60°.
B, I, C. Angle of inclination of pelvis to spinal column, equal to 150°.
C, I, J. Angle of inclination of sacrum to spinal column, equal to 130°.
E, F. Axis of the inlet.
L, M. Mid-plane in the middle line.
N. Lowest point of mid-plane at the spine of the ischium.

plane of the pelvis to the spinal column. The pelvi-vertebral angle—that is, the angle formed between the superior plane of the pelvis, and the lumbar portion of the spine, forms an angle of about 150°. This angle varies slightly in different individuals, but is diminished somewhat by the anteflexion of the spine, and drawing up of the inferior extremities, which obtains in the obstetric position. The study of the above particulars may be facilitated by means of a diagram. (Fig. 92.)

The mid-plane, or strait, of the pelvis, unlike the superior plane, is not bounded by a line, all the points of which lie in the same plane, and the term plane must not be taken therefore in an exact and mathematical, but in an obstetric and conventional sense. Its boundaries may be stated as follows:—Commencing at the symphysis pubis anteriorly, at about the level of the upper margin of the obturator foramen, it crosses the obturator membrane immediately below the point of exit of the obturator nerve and artery; from thence it descends the spine of the ischium along the oblique ridge on the inner surface of that bone. It then traverses the lesser sacro-sciatic ligament, and ascends to the level of the lower portion of the third piece of the sacrum. The curve L N M represents a section of the plane in the mesial line. Its lowest point is indicated by the letter N, and this corresponds to the apex of the ischial spines. The general inclination of this plane to the horizon is considerably greater than that of the superior plane—in other words, it makes a less angle with the horizon, the difference being about 30°. The importance of the study of this plane will be more particularly dwelt on when speaking of the canal of the pelvis.

The inferior plane, plane of the outlet, or inferior strait, is commonly described as extending between the lower margin of the symphysis pubis anteriorly, and the tip of the coccyx posteriorly. There are, however, valid reasons for dismissing the coccyx from our calculations on this head; for being moveable, and potentially endowed with elasticity through the medium of its connexion with the perinæum, any influence it exerts upon the progress of labour partakes of the nature of a force applied from without, and differs *toto cœlo* from the rigid resistance of all other parts of the pelvis. The motion enjoyed by the coccyx is so great, that before it has reached its limit it ceases to influence the antero-posterior diameter of the outlet, and the mechanical conditions under which the fœtal head escapes from the pelvis are then imposed by the apex of the sacrum. This is proved by the following measurements:—In a large female pelvis, the antero-posterior diameter of the outlet, measuring from the tip of the sacrum, is 4·5 inches, and from the tip of the coccyx, 3·625. The amount of motion enjoyed by the coccyx equals one inch—that is to say, the coccyx can be pushed back one inch from its ordinary situation by the pressure of the fœtal head and the action of the muscles in connexion with the coccyx. If we add this inch to the ordinary diameter, 3·625, we have 4·625 as the distance from the tip of the coccyx to the lower border of the symphysis pubis. As this is greater than 4·5 inches, the distance from the last-mentioned point to the extremity of the sacrum, it is clear that the sacrum, and not the coccyx, bounds the outlet of the pelvis, and determines how large a body shall pass out

Fig. 93.



A. Axis of superior plane. B. Axis of mid-plane.
C. Axis of inferior plane. D. Axis of canal.
E. Horizon.

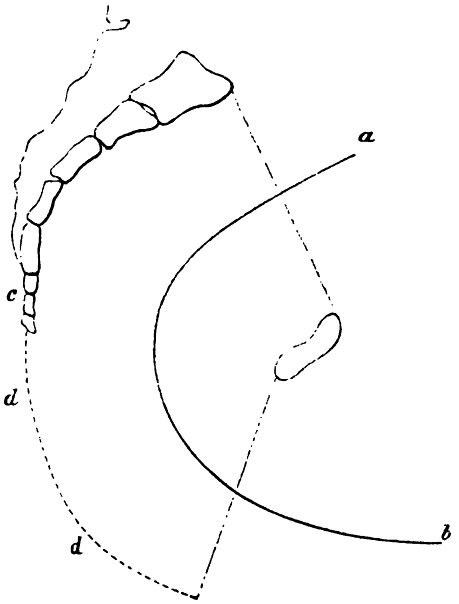
of it. The inclination of the plane of the outlet to the horizon, if the measurement to the tip of the coccyx be taken, is, according to Naëgele, from 10° to 11°. If the tip of the sacrum is taken as the osseous limit posteriorly, the inclination will not of course be so great, the angle being in this from 15° to 16°. The planes of the pelvis meet, if prolonged anteriorly, about 1·5 inch in front of and below the symphysis pubis. These several planes, it must be borne in mind, vary in their relations to the horizon and to the spinal column, but constantly preserve the same relations between themselves. The sacro-iliac articulations are not free enough to allow of any variation in the pelvic planes. As a corollary to this, it follows that the axes of the planes of the pelvis must be fixed and determinate, and the course of the fœtal head under normal conditions must be fixed and determinate also.

The Axes of the pelvis are certain imaginary lines, drawn at right angles to the several planes of the pelvis. The axis of the superior plane or axis of the inlet, if extended or prolonged superiorly, will pass through the umbilicus, and, inferiorly, will impinge upon the anterior surface of the coccyx, near its point. This line makes with the horizon an angle of about 30°. The axis of the mid-plane, if produced inferiorly, will fall upon a point rather nearer to the anus than half the distance between the anus and the tip of the coccyx; and superiorly, will issue some inches above the umbilicus. The angle made with the horizon by this line is about 50°. The axis of the outlet, when the point of the coccyx is not displaced by the egress of the fœtus, falls from the promontory of the sacrum to midway between the tuberosities of the ischia, or to the anus if continued through the soft parts. The angle made by this axis with the horizon is about 80°. But, as already stated, it is better to consider the axis of the outlet as the axis of a plane extended between the inner margin of the symphysis pubis and the apex of the sacrum. Such a line would emerge, superiorly, a little in front of the sacral promontory, and, below, would fall a little behind the anus. There would also be a small diminution of the angle made by the axis of the outlet with the horizon. This represents the actual state of things during labour, when the coccyx is moved back, and the differences just enumerated necessarily follow. (Fig. 93.)

These axes are all of them of importance chiefly as they bear upon the true axis of the pelvic canal, which represents the path traversed by the fœtus in its passage from the maternal nidus to the external world. The axis of the canal is a subject upon which many diverse opinions have been held, and most of them evidence a wish for diagrammatic perfection rather than a patient observation of Nature. The study of the axes of the planes of the inlet and outlet alone, has led to much incorrect opinion, the axis of the canal being held to be identical with the axes of these two or three planes; whereas, the axis of the canal is identical with every imaginary intermediate plane from the inlet to the outlet, at the point where the axis cuts the plane. One observation will show the fallacy of representing the axis of the canal by the axes of isolated planes. The axis of the outlet of the pelvis only, and the axis of the whole of the lower part of the pelvic canal, are usually confounded together, whereas they are totally distinct. The axis of the outlet is downwards and backwards, being at right angles with the inferior pelvic plane, while the produced inferior extremity of the axis of the canal, being the axis not of one plane but of all, looks downwards and forwards. It is difficult to conceive how such men as Müller and Rœderer should have fallen into the error of making the pelvic axis a right line. Baug, Choulant, Carus, and Camper represent it by means of an *arc de cercle;* and the circle of Carus finds favour at the present time with many obstetricians. Camper is, perhaps, the model of a mind addicted to diagrams; and, as is well known, he fell into diagrammatic vagaries about other things than obstetrics.

A rougher idea, again, of the direction of the pelvic axis could hardly be given than by endeavouring to express it by the meeting of the axes of the inlet and outlet; yet this is held by some. Levret caught a glimpse of the truth when he proposed to represent the value of the pelvic curve by perpendiculars drawn from three planes. Had he said thirty or three hundred planes, he would have been nearer the fact, the axis of the pelvis being in reality, as already stated, a curved line, passing through the centre of every plane between the plane of the inlet and the plane of the outlet. Of all recent authors, Dubois leaves least to be wished for in his description of the pelvic curve. We must be careful not to disjoin the curve of the pelvis from its connexion with other parts through which the fœtus passes. This curve is only complete when we have added to it the axis of the uterus above and of the distensible soft parts below. Collectively, the parturient line is expressed by an irregular parabolic curve, fixed from the brim of the pelvis to a line drawn from the inferior margin of the symphysis pubis to the apex of the sacrum, but variable above, from the fundus uteri to the pelvic inlet, and below from the outlet to the margin of the perinæum, according to the position of the uterus, and the facility with which the coccyx is pushed back or the perinæum distended.

FIG. 94.



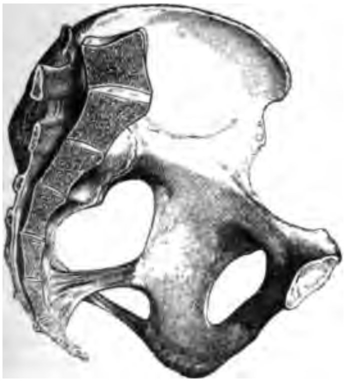
a, b. Axis of the path of the fœtus through the pelvis.
c. Coccyx. *d, d.* Distended perinæum.

The study of the axis of the inlet and of the outlet of the canal has important practical bearings. In order that the uterus may act with the greatest efficiency in the first stage of the labour, where the motor force is required in the direction of the axis of the inlet, it is necessary that the axis of the uterus should correspond with the axis of the inlet. If the gravid uterus be anteflected or retroflected from the true position, the progress of labour is impeded. If the axis of the uterus approaches the horizon, the fœtal head is impelled against the promontory of the sacrum; if it approaches the perpendicular, it is urged against the pubis. The derangements of the axes of the uterus and pelvis have the same effect as distortion of the brim, only the difficulty is easily remediable. By bending the spine upon the pelvis, as in the usual obstetric position, we may depress the axis of the uterus; and, on the other hand, if it requires to be raised, it is necessary to support the uterus with a bandage, or place the patient on her back. It is necessary that we should recognise the direction of the axis of the outlet in examinations; in introducing the hand into the uterus; in assisting the birth of the head; and in all traction in midwifery operations of every kind.

The Canal of the pelvis is the most important matter in relation to this assemblage of osseous structures, and it is especially necessary to consider the walls of this canal, and the direction taken by the different portions of the pelvic parietes. It may be observed that the inner surface of the pelvis is made up of a number of smooth inclined planes, and that the inclination of these planes is so arranged as to accomplish two principal objects: the one, a gradual alteration of the direction of the longest diameter of the canal; the other, a more sudden change in the direction of the planes themselves. Between the superior and middle planes of the area of the pelvis, we may observe in the pelvic walls of the inlet four inclined planes: of these, one is formed by the whole of the internal surface of the body of the pubic bones; and a second, by the upper half of the sacrum. The direction of both these inclines is downwards and backwards. The two other inclined planes are placed laterally, and are composed of the ilia and ischia, terminating in the spinous processes of the latter. The direction of these lateral planes is downwards, backwards, and inwards, so that at the spines of the ischia the walls of the pelvis approximate to each other more closely than they do at the commencement of the superior lateral planes, below the linea ilio-pectinea. The inclined planes of the outlet, as far as the bony pelvis is concerned, may be said to be five in number; one posterior and four lateral. The direction of the posterior, consisting of the lower half of the sacrum and the adjacent portions of the sacro-sciatic ligaments, is also downwards and forwards. Of the lateral inclined planes of the outlet, two, consisting of the internal surfaces of the ischia, below the level of the spinous processes, terminate in the tuberosities, and are directed downwards and forwards, and slightly inwards. The other two lateral planes of the outlet are formed by the descending rami of the pubic bones, and the ascending rami of the ischia; they extend from the middle of the arch of the pubis to the tuberosities of the ischia, their direction being upwards, forwards, and inwards. If we considered the bony pelvis as a complete canal, it would be pinched inwards at the points of the ischial spines and tuberosities of the ischia, and bulged outwards at the sites of the great sacro-sciatic foramina. These circumstances, together with the shallowness of the anterior, or pubic portion, contribute to alter the diameters of the superior, middle, and inferior planes. The key to the pelvic mechanism, in an obstetric sense, may be said to be the spinous processes of the ischia. Here it is that the fœtal head makes its most decided change of position. The changes of position and direction which bring the fœtal head to occupy, at the outlet of the pelvis, the right oblique position, as the most common presentation, are effected mainly by the anatomical adaptations of the pelvis, aided by the mechanism of the fœtus, and the position of the rectum in the notch by the side of the sacrum on the left side. (Fig. 95.)

The normal depth of the female pelvis is, according to Burns, as follows:—From the promontory of the sacrum to the tip of the coccyx, from 5 to 6 inches; from the brim to the tuberosity of the ischium, 3·75 inches; anteriorly, from 1·5 to 2 inches. The variations which obtain in this respect exercise a considerable influence upon the progress of labour. Deep pelves are often somewhat funnel-shaped, and shallow pelves are not merely wide in appearance, but wide in relation to the size of the body. If a pelvis be very much shallower than usual, the points of resistance to the passage of the fœtal head are of course diminished in number, and the track of the fœtus is materially shortened also: labour, under these conditions, is unusually rapid, unless there is co-existent distortion. It is well to bear in mind, that the shortest pelvic diameter is that between the two ischial spines (3·5 inches), and the longest is an oblique diameter, extending between the sacro-iliac synchondrosis of either side to the tuberosity of the ischium opposite. This line is 6 inches in length, and corresponds very nearly in position with the long axis of the fœtal head in an ordinary occipito-anterior presentation, when the head is fairly lodged in the cavity of the pelvis.

FIG. 95.



Side view of pelvis.

With regard to the External Measurements of the pelvis, it may be stated that the same method of ascertaining the antero-posterior, lateral, and oblique diameters, will assist us in understanding the external diameters. The antero-posterior diameter of the pelvis, externally, is about eight inches; the external transverse—i.e., from crest to crest of the ilia—about 14 inches; the oblique—i.e., from the antero-superior spine of one ilium to the postero-superior of the other—about eight inches. These diameters are all in the same plane. There are other diameters in various planes, a knowledge of which is useful. For instance, from the spine of the last lumbar vertebra to the antero-superior spine of either ilium, 6 inches 7 or 8 lines; from the symphysis pubis to the infero-anterior spinous process, about 4 inches; from the tuberosity of either ischium to the postero-superior spine of the ilium of the opposite side, 6 inches 6 themselves to the smallest diameters of the pelvis. Th bi-temporal diameter, which is variable to a very slight e: is little more than two inches and a half, the bi-malar dia is barely three inches, and the bi-mastoid is not much ove inches. These diameters all pass through the cavity pelvis, between the spines of the ischia, in ordinary oc anterior presentations, as well as in those cases wher occipito-posterior presentations have passed into the fc The unyielding portion of the head might be represent an oval plane, having one end at the back of the neck, ar other somewhat above the brow, while its conjugate dia would nearly correspond with a line passing through the from ear to ear. It is evident that whatever error a stetrician might fall into as regards the actual position head, from failing to take into account the moulding th varium undergoes *in transitu*, none can arise from this s as far as the face and ears are concerned. In cases of tion or contraction, then, it follows that a recognised e cheek-bone, will be a better index to the actual position head than any point in its more moveable part. Dr. Har was of opinion that the compression of the cerebral spheres during labour produced a paralysing effect upo limbs of the fœtus, and tended to keep them motionless the action of the uterus—an opinion shared in by Dr. botham, but which is probably without foundation.

That part of the head which is called the skull-cap co of the occiput, the parietal bones, and the frontal bones temporal bones scarcely require to be noticed. In the majority of cases, these bones are soft and semi-cartilag and connected to each other only by the dura mater and their continuous edges are bevelled off, and they may be to overlap each other to a very considerable extent. Be the edges of contiguous bones are grooves called ***sutures*** where three or more sutures meet, there is a deficie bone, called a *fontanelle*. The arrangements for solid the face and base of the skull are not more conspicuou the provisions made for plasticity here; in whatever dir compression is applied, it results in a modification of th tour of the head, partly because the bones bend, and because they overlap in various directions. As a genera it may be laid down, that in ordinary presentations the the head remains in the pelvis, the more ovoid will it be always provided that the pelvis is not absolutely defc

There is a considerable discrepancy between the estimates of dimension given by various writers. Dr. Meigs is very positive in affirming that the estimate usually given of the occipito-frontal and occipito-mental diameters is far too low. It is not unlikely that much may depend upon the period when the measurements are taken, for certainly the cranium of a fœtus, immediately after what is vulgarly called a "hard labour," is materially longer than twenty-four hours later, and, it may be presumed, than before it has been subjected to the modelling process by which it attains its adaptation to the maternal passages. Confining ourselves, however, to average figures, which shall represent rather the relative diameters of the fœtal head, than an exact estimate of each individual measurement, the following table may be relied upon as sufficiently accurate for all practical purposes. The really important consideration is not the absolute, but the relative, admeasurements of the skull; we are utterly unable, in any given case, to determine the magnitude of the body about to pass, and are therefore compelled to frame our mechanical appliances upon considerations of proportion.

1.	The occipito-frontal diameter ...	4·5 inches	to 4·75
2.	The occipito-mental	5·0 „	„ 5·25
3.	The cervico-bregmatic	3·75 „	
4.	The sub-occipito-bregmatic ...	3·25 „	
5.	The transverse or bi-parietal ...	3·5 „	
6.	The fronto-mental	3·25 „	

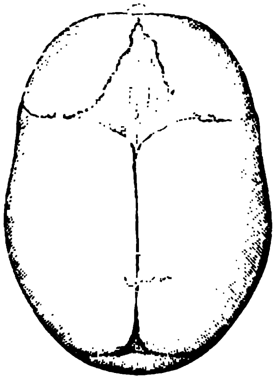
It will be observed that the two first of these measurements are particularly noticed as varying, and they do, in fact, vary as labour advances, being the directions in which the greatest range of alteration is admissible. The circumference of the head varies, of course, according to the direction in which it is taken. Thus, the ordinary presenting circumference, which passes under the occiput, and round the parietal bones, to a little behind the bregma, is about 11·5 inches, the occipito-frontal is rather more than 14 inches, and the occipito-mental is nearly 16 inches. It is unnecessary to burden the memory with any further details on this head.

The sutures with which we are mainly concerned are the coronal, the sagittal, and the lambdoidal; the temporal sutures between the temporal bones and the inferior concave border of the parietal bones are comparatively uninteresting, because the ear is quite as easy, if not easier, to recognise in all cases where it is desirable to know the position of that part of the head. The coronal suture—so called because the ancients wore their triumphal crowns in that position—is the line of demarcation between the frontal and parietal bones; it extends transversely, and almost vertically, over the head, from the summit of the squamous portion of the temporal bone on one side, to a corresponding point on the other side; its line is broken by the great or anterior fontanelle. The sagittal suture projects directly backwards from the coronal in the middle line, and lies between the opposed superior borders of the two parietal bones; posteriorly it abuts upon the apex of the lambdoidal suture. The lambdoidal suture — so called from its resemblance to the Greek Λ—is formed by the opposed borders of the occipital and parietal bones: if two parietal bones are placed *in situ*, it will be seen that, owing to the obliquity of their posterior borders, an angular recess is formed where they meet; into this recess the occipital angle fits, and just between the superior angle of the bone and the angular recess alluded to, is the small or posterior fontanelle. There is a suture between the two divisions of the frontal bone which varies in width, but is always recognisable where it abuts upon the great fontanelle; the sagittal, coronal, and lambdoidal are, however, the important sutures, and of these the sagittal is paramount.

The fontanelles are spaces between some of the cranial bones, into which the sutures debouch. British obstetricians generally take cognisance only of two—an anterior or greater, and a posterior or lesser. Continental writers speak of two others—the temporal; but as the finger could hardly impinge upon them unless the orbit were within reach also, it appears unwise to divert attention from the more to the less valuable aid to diagnosis. The anterior or greater fontanelle, or bregma, is a rhomboidal space into which two fingers may be easily laid; its long diameter is from before backwards, and the greater half of the rhomboid is in front of its lateral angles. The sagittal suture joins its posterior angle, the inter-frontal enters its anterior angle, and the two halves of the coronal suture debouch into its lateral angles. The posterior or lesser fontanelle is small and triangular; it receives the sagittal suture into its anterior angle, and the two limbs of the lambdoidal suture into its lateral angles. The posterior fontanelle is the one with which it is most necessary to be familiar.

However easy it may seem at first sight to determine which suture or which fontanelle is touched in any given examination,

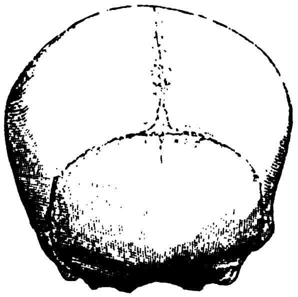
FIG. 97.



Anterior and posterior fontanelles.

beginners are very often mistaken, and there are some circumstances which may embarrass others than tyros. It may be as well to point out a few distinctions between each suture and each fontanelle. The sagittal suture may be recognised by its debouching into *two* fontanelles; the coronal by its joining a large fontanelle at one end, and leading to a more unyielding part of the cranium at the other; the lambdoidal by its joining only the small fontanelle. The anterior and posterior fontanelle, if they should happen to approximate in size to each other, may yet be distinguished by the anterior having four angles, and its four sides bounded by bony margins, which do not project into the space; while the posterior has but three angles, and the bones around it are the three acute apices of the occipital and two parietal bones. There is occasionally a false fontanelle in the course of the sagittal suture, the result of defective ossification in the opposed edges of the two parietal bones; if it is borne in mind, however, that only two lines of suture can be traced from such a space, it cannot be a source of any great difficulty. Before the membranes are ruptured, it may be somewhat difficult, when they are tough, to appreciate all the points of difference between the sutures and fontanelles; sometimes ossification is so abnormally advanced or delayed as in a measure to destroy the characteristics of the fontanelles; and when the bones of the head overlap each other very much during its passage through the pelvis, it may be matter of great difficulty to recognise anything very distinctly. The greatest difficulty in the way of accurate diagnosis is presented perhaps in those cases in which the membranes have been ruptured early, and the head has been long in the pelvis, tightly girt by a rigid cervix uteri. Under these circumstances, the scalp becomes swollen, puffy, and infiltrated with serum and sometimes blood, and nothing can be felt distinctly through it; it may be almost impossible to pass the finger beyond the puffy tumour, so as to reach a part of the head covered by natural scalp, and such cases have been mistaken ere now for breech presentations.

FIG. 98.



Bi-parietal diameter; sagittal and lambdoidal sutures, with posterior fontanelle.

There are some general considerations connected with the size of the fœtal head which are worthy of attention. In the first place, it must be remembered that the average dimensions of the male fœtal head are considerably greater than those of the female; the excess in the circumference which most commonly presents is about half an inch, and this is quite sufficient to make a serious difference both in the chances of danger accruing to the infant and the mother. The question of safety to mother and child is very much a matter of time; whether the delay results from rigidity of the passages as in primiparæ, or from greater size of the head, as when the fœtus is masculine, the result is pretty nearly the same. The late Dr. Joseph Clarke, of Dublin, a very distinguished accoucheur, investigated very minutely the question of the difference of the size in the brain of the two sexes at the time of birth. He ascertained, by the admeasurement of a large number of cases, that the circumference of the male head is greater by half an inch, or about the twenty-eighth part of the entire circumference, than the female head, at the time of birth. The fact that the male fœtal head is actually larger than the female having once been established, all the disastrous consequences of which Prof. Simpson has given statistical proof follow as inevitable. In cases of tedious labour, convulsions, puerperal convulsions, puerperal fever, ruptured uterus, hæmorrhage, and instrumental delivery, by far the greater number of children are males. In cases of pelvic abscess, ruptured perinæum, and vesico-vaginal fistula, the same undesirable pre-eminence attaches to male children. The following are the principal conclusions of Prof. Simpson:

1. Of the mothers that die under parturition and its immediate consequences, a much greater portion have given birth to male than to female children.
2. Of still-born children, a larger proportion are male than female.
3. Of children born alive, more males than females suffer from the morbid states and injuries which result from parturition.
4. More males than females die in the early period of infancy, and the disproportion diminishes from birth to some time afterwards.
5. More dangers occur, both to mother and infant, in first than in subsequent labours.
6. Of children which die *in utero* before labour, as many are females as males.
7. Of the accidents which happen after the birth of the fœtus itself, as many occur with female as with male children.

There are other aphorisms on this question, laid down by the same authority, but they are only corollaries of the foregoing propositions, and need not, therefore, be stated.

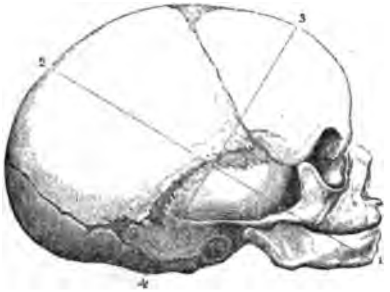
Besides the effects of sex in modifying the size of the fœtal head, and increasing the pain and danger of parturition to the mother and child, we have to consider the effects of race and civilization upon the head of the fœtus at the time of birth. All ethnological researches tend to show, that, with the advance of civilization, the human head has increased in size. The oldest crania in existence, much older than the mummies of Egypt, are the skulls found in various parts of the world in diluvial caves, with the fossil remains of extinct animals. These skulls apparently belong to other races than those which now inhabit the countries in which they are found; they have a small development of the brain, and resemble the skull of the Carib in flatness of the frontal bone. The heads of Peruvian and Egyptian mummies are considerably below the size of the European cranium. Nothing within the range of human anatomy stands in stronger contrast than the cerebral size and development of the New Hollander, or the Bushman, and the Caucasian races. The different condition of education amongst different classes of the same race also has its effect on the size of the brain and cranium. Hatters state that the size of the head is greater in the same classes in towns, than in agricultural districts, in the educated than the uneducated. Tiedemann gives from 3lbs. 2oz. to 4lbs. 6oz. troy weight as the average weight of the adult male European brain; but he found that of Cuvier weighed upwards of 4lbs. 11oz, and that of Dupuytren 4lbs. 10oz. The same authority gives the average weight of the female brain as from 4 to 8 oz. less than the male; and he found that the different size of the male and female brain was perceptible at birth, in this according with the views of Dr. Joseph Clarke and others. The increase is not confined to the head alone. Dr. Clarke found that, on the average, taking the whole body, males weigh 9oz., or nearly one-twelfth of the entire weight, more than females. It seems a clear inference, that the brain and head of the uncivilized and the uneducated must be, on the average, smaller than those of the educated and civilized; and we have seen, in the comparison of the male and female head at the time of birth, how small a difference in the size of the fœtal head is sufficient to increase the dangers, and, necessarily, the sufferings of parturition. Dr. Simpson is of opinion that the comparative difficulty of parturition with male and female children extends to the fœtus of civilized and uncivilized races, and he refers the increased suffering of the civilized woman in childbirth to the size of the fœtal head. Some writers have expressed the opinion, that savage women do suffer as much, or nearly so, as the women of civilized races. But the general bearing of all the knowledge we possess on this subject, supports the view, that barbarian women suffer far less than women in a state of civilization. The size of the fœtal head must be considered the most important element in this matter, though at the same time there is the greater sensibility induced by the habits and social condition of the civilized and highly-cultivated female to be taken into account.

Civilization not only influences the size, but the relative size of the different parts, of the fœtal head. In uncivilized races the tendency is to increase the occipito-mental diameter, by the protuberance of the occiput, and the greater development of the lower part of the face, and to diminish the occipito-frontal diameter by the flattening of the frontal bone, and the low development of the anterior cerebral lobes. The diminution of this diameter must lessen the difficulty in the passage of the fœtal head. In the case of a Negress, whose labour I had the opportunity of witnessing, the great mass of the fœtal brain was behind the auditory foramen, the fœtal head having the shape represented in Fig. 100.

Other influences, besides civilization and education, have an influence upon the size of the head. The Caribs flattened the foreheads of their children, and the continuance of this practice through succeeding generations produced a natural flattening of the anterior part of the head, until the Carib infants were born with flat heads. The practice of flattening the head prevailed in Mexico, and, at an early date, in the eastern parts of Europe. Hippocrates gives an account of the Macrocephali, a Scythian race, believed to have inhabited the Crimea, of whom the Father of Physic says :—"There is no other race of men which have their heads in the least resembling theirs. At first, usage was the principal cause of the length of their head, but now nature co-operates with usage. They think those the most noble who have the longest heads. It is thus with regard to the usage: immediately after the child is born, and while its head is still tender, they fashion the head with their hands, and constrain it to assume a lengthened shape, by applying bandages and other suitable contrivances, whereby the spherical form of the head is destroyed, and it is made to increase in length. Thus at first usage operated, so that this constitution was the result of force; but in the course of time it was formed naturally, so

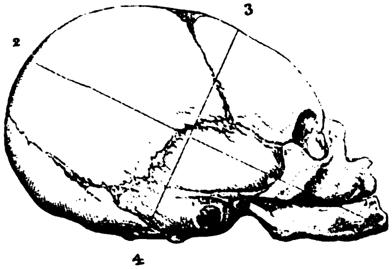
ge had nothing to do with it." Mr. Adams, the
translator of Hippocrates, cites some researches of
thke, as affording a remarkable corroboration of the
ng observations. Certain tumuli have been excavated
ent years at Kertch, and there were found in them
l skeletons, in which the form of the head was greatly
ated, so as to resemble the shape described by Hippo-
s in the Macrocephali. It is probable that one object
in view by the races accustomed to flatten the head was,
of producing a shape favourable to easy parturition.

FIG. 99.



Mature fœtal skull.

FIG. 100.



Skull of a Negro fœtus.

Binding the heads of children upon a board is practised in some parts of Europe at the present day. I have seen Polish infants arranged in this manner, apparently as a mere fashion or habit. The round head of the Greek and Turk is believed to have been in part produced by the effect of the national cap and turban, continued through successive centuries. The preceding woodcuts show the different diameters of the Negro and Caucasian skulls in the fœtus. (Figs. 99, 100).

CHAPTER XXII.

THE MECHANISM OF LABOUR.

Great improvements in any department are commonly of slow growth. This may be said emphatically of our knowledge of the Mechanism of Labour, which, with the motor forces engaged in parturition, stand at the very foundations of the science and art of Obstetrics. More than a century ago, to the honour of the Dublin school of midwifery be it said, Sir Fielding Oulde called in question the opinion which had previously prevailed universally, that the head entered and passed through the pelvis in the direction in which it emerges—namely, the antero-posterior diameter. In his little work, published in 1741, he taught that the face of the child did not lie upon the sacrum of the mother, but was always, in natural cases, turned to one side or the other. He believed, however, that the chin of the child was turned towards one of the shoulders, the neck of the fœtus being partly rotated upon its body. This error respecting the different position of the fœtal head and trunk was corrected by Smellie, and the belief in the oblique position of the head in the pelvis, gained ground amongst accoucheurs in different countries. In 1771, Saxtorph, of Copenhagen, and Solayres de Renhac, of Montpellier, published almost simultaneously the discovery that the head not only *enters* the pelvis with the long diameter in one of the oblique diameters of the pelvis, but that the long axis of the head, in the great majority of cases, occupied the *right* oblique diameter; the occiput being directed towards the left foramen ovale, and the forehead towards the right sacro-iliac symphysis. Solayres de Renhac went, however, every diligent practitioner who may devote his energies to the prosecution of this subject. In every particular, we must analyse and synthesize the movements of the fœtal head, and also the motor forces and mechanisms, which urge and direct it in its course through the pelvis and parturient canal.

The largest movement of the fœtal head in parturition, is that through the canal of the pelvis and the passage formed by the vagina and soft parts. This movement is common to all the positions in which the head passes through the pelvis. In its performance, the centre of the head corresponds pretty nearly with the axes of the hard and soft portions of the parturient canal. To this common movement are superadded various movements of the head upon its bilateral axis, its antero-posterior axis, and its vertical axis, all of which vary in character and extent according to the position in which the head first engages in the pelvis. These movements and differences considered in relation with the pelvis, constitute the Mechanism of Labour, and the several "Positions" as they are called, in which the head presents and passes through the pelvis and soft parts. The head lies at very various depths at the commencement of labour. Sometimes the developed cervical portion of the uterus, and the contained fœtal head, lie entirely in the pelvis, before the commencement of any uterine action. At others the head is high up in the pelvis, and has scarcely, if at all, entered the brim. As Dr. Rigby points out, the head is more frequently low in the pelvis in primipara, and high up in multiparous women. The cause of this is probably the greater rigidity of the abdominal walls in primiparæ as compared with multiparæ. In many multiparous cases, the head is, however, wholly within the pelvis for some time before the commencement of labour. For the description of labour, it is however convenient to take those cases in which the head is high up as the standard; as this gives us an opportunity of tracing the steps by which the head descends through the pelvic canal.

The mechanism of labour is necessarily somewhat complicated, and it should be the aim of all teachers to render it as simple as possible, by describing as few varieties as are consistent with nature, and requisite to be understood in practice. It is easy to multiply varieties in the position of the head, by insisting upon trivial differences; but disservice rather than service is done in this way to the advance of obstetric knowledge. It is to be hoped that each successive describer of the process, having the aid of those who have gone over the same subject before him, may do something towards rendering the obstetric mechanisms more and more intelligible, and more decidedly linked with practice.

There are four principal Positions in which the fœtal head presents in the pelvis, and these positions we shall now proceed to consider. The two first positions are termed Occipito-Anterior, because in those the occiput is placed towards the Pubis. The other two are called Occipito-Posterior, because in these the occiput is turned towards the Sacrum.

The movements of the fœtal head during its passage through the pelvis are described under the following terms:—

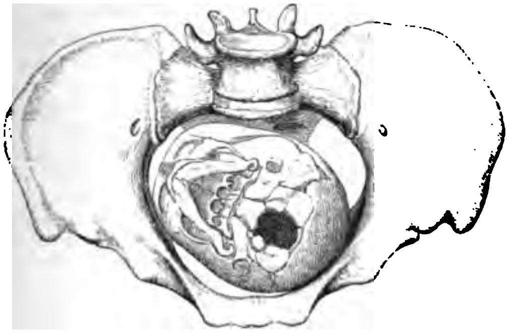
OBLIQUITY,
FLEXION,
ROTATION,
EXTENSION, and
RESTITUTION.

Each of these processes requires careful study in order to understand the various processes summed up as the mechanism of labour.

In the First Position, the head, as already mentioned, enters the pelvis in the right oblique diameter, or in a line between the transverse and oblique diameters. The occiput is placed towards the left acetabulum, and the forehead towards the right sacro-iliac synchondrosis. At first, the long diameter of the head is parallel, or nearly so, with the superior plane of the pelvis, the occiput and sinciput being about on the same level. But the right side of the cranium is considerably lower than the left, so that the most depending part of the cranial surface is the protuberance of the right parietal bone. This lateral depression is called the Obliquity of the Head. As the head descends, there is a slight movement upon the bilateral axis, and the occiput generally becomes lower in the pelvis than the forehead. This descent of the occiput is called the Flexion of the Head. The following engraving shows the entrance of the fœtal head into the pelvis in the right oblique diameter after it has commenced its descent. The mastoid process of the left temporal bone and the chin are at this time the highest portions of the fœtal head; the right half of the occipital bone, and the adjoining portion of the temporal bone, being depressed.

If we examine per vaginam when the head is in the upper part of the pelvis in this position, the right tuber parietale is felt through the walls of the anterior portion of the cervix

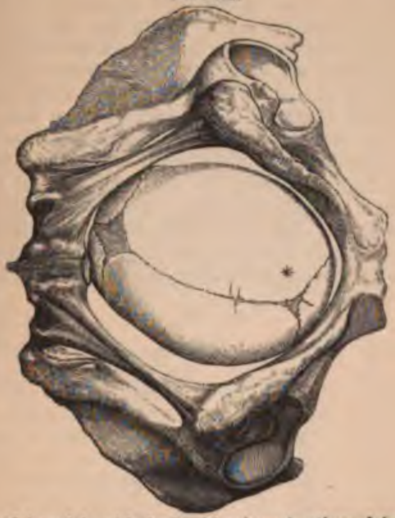
FIG. 101.



Brim of the pelvis and base of the fœtal cranium in the first position.

uteri. This is the point with which the finger comes in contact at the most depending part of the head. The right ear of the child can be felt behind the pubes, if the os uteri is sufficiently open to allow of its being reached. At this time the os uteri does not occupy the axis of the pelvic canal, but is more posterior, and directed towards the upper part of the sacrum. If the finger is passed into the os uteri, the sagittal suture is felt crossing the field of the os, in an oblique direction. The patient lying on the left side, the accoucheur standing or sitting behind, and bending over her to make the examination, feels the sagittal suture running forwards and downwards in one direction, and upwards and backwards in the other. The sagittal suture divides the os uteri unequally, a larger portion of the middle and upper part of the right than the left parietal bone being included within the ring of the os. It is this middle and upper portion of the right parietal bone which is felt in making an examination at this period, and it is here that the tumour of the scalp is formed, when it is caused by the pressure of the head against the partially dilated os uteri. If the os uteri is sufficiently dilated to allow the finger to be passed along the sagittal suture, it arch of the pubis, this portion of the head becomes to a great extent a fixed point, and the frontal bone and face of the child come down, describing an arc in their progress. This is called the Extension of the Head, the chin being now separated from the sternum, and the forehead appearing as the lowest part of the cranium.

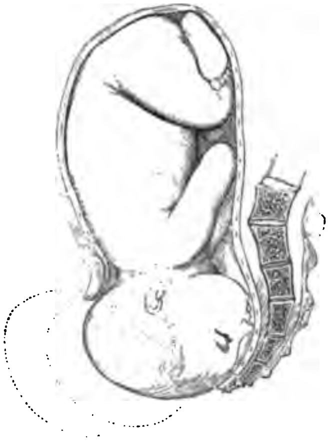
FIG. 102.



Outlet of the pelvis, with the fœtal head passing through in the first position. The asterisk marks the presenting portion.

Immediately after its emergence from beneath the pubic arch, the head usually rotates back again to the aspect it held in the upper part of the pelvis, the face becoming turned towards the right thigh of the mother. This re-rotation, which is termed the Restitution of the Head, is effected in the following manner :—It generally happens, that as the head escapes, the right shoulder of the fœtus is lowest in the pelvis, and impinges upon the anterior surface of the right ischial spine. From this point it rotates forwards towards the arch of the pubis, under which it passes out, the left shoulder resting upon the perinæum, and generally escaping first. Thus the body of the fœtus rotates in an exactly opposite direction to the previous rotation of the head. The left side of the head glides down the left ischial plane, and the right shoulder glides down the plane of the right ischium. If it should happen, which is occasionally the case, that the left shoulder should be lowest in the pelvis, it glides down the left ischial plane, the shoulders rotate in the same direction as the head, and the face of the child is then turned downwards and towards the left thigh of the mother. When the pelvis is large, and the delivery effected suddenly, the shoulders are sometimes expelled in the transverse diameter of the pelvic outlet without any rotation. In the emergence of the head and trunk from beneath the pubis, the direction impressed by the perinæum and the expulsive efforts is such that the head turns upwards between the thighs of the mother, in front of the symphysis pubis, as represented in the following engraving:—

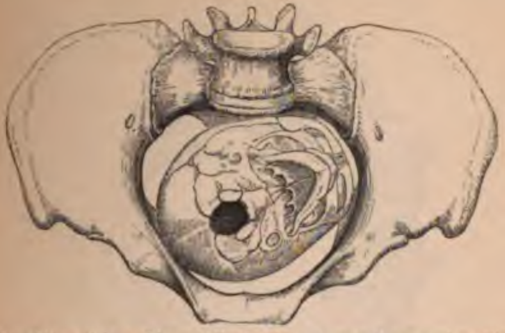
FIG. 103.



Extension and emergence of the head.

In the Second Position, the occiput is turned towards the right acetabulum, and the forehead towards the left sacro-iliac synchondrosis, as the head passes through the brim. The left part of the base of the skull is lowest, the occipital dip, or flexion, being the same as in the first position. (Fig. 104.)

FIG. 104.



Brim of the pelvis, and base of the fœtal cranium in the second position.

The left side of the head is the lowest in the second position, as the head descends, the same portions of the left parietal bone being prominent, instead of the right. The left ear is felt behind the pubis. The sagittal suture is now found nearly parallel to the left oblique diameter. In an examination, the finger passes upwards and forwards to reach the posterior fontanelle, and downwards and backwards to reach the anterior. The occiput glides down the right ischial planes. The rotation is precisely the same as in the first position, except that it is in the reverse direction. The rotatory movements of the shoulders are also reversed, the face of the child generally turning downwards, and to the left thigh of the mother. The following figure represents the head passing through the pelvis in the second position. (Fig. 105.)

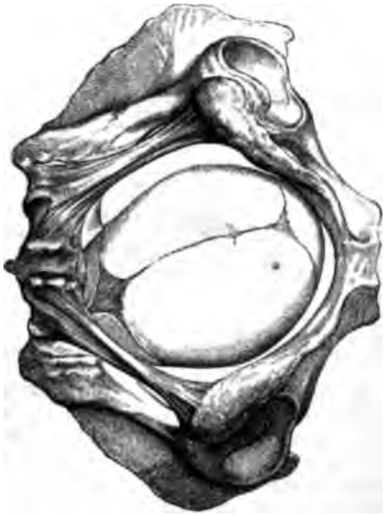
Let us now proceed to recapitulate the different evolutions performed by the fœtal head in its passage from the pelvic brim to the external world in the first and second positions.

I.—The movement in the Parabolic Curve formed by the axes of the pelvic canal and of the vagina.

The different parts of the fœtal head change their position in this progress, but the centre of the fœtal head may be considered as traversing the axes of the pelvis and of the soft parts of the parturient canal.

II.—The movement of the fœtal head upon its Occipito Frontal Axis.

FIG. 105.



Outlet of the pelvis, and the fœtal head passing through it in the second position. The asterisk marks the presenting portion.

This movement causes one side of the fœtal head to become lower than the other during the whole progress of labour, after the head has entered the brim, constituting the Obliquity of the Head.

III.—The movements of the fœtal head upon its Bi-parietal Axis.

These movements consist—first, of the depression of the occiput; and second, of the depression of the sinciput. In the descent of the head through the pelvis, the occipital pole is depressed, constituting the Flexion of the Head; but as it emerges under the pubic arch, the frontal pole becomes the lowest point. This oscillation of the forehead downwards upon the bi-lateral axis, constitutes what is termed the Extension of the Head.

IV.—The rotatory movements of the fœtal head upon its Perpendicular Axis.

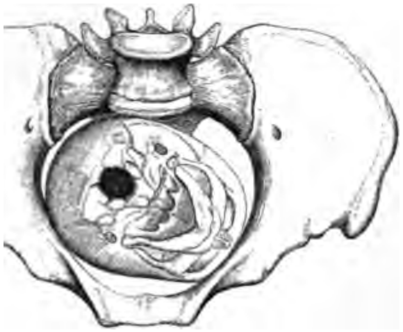
These movements constitute the rotations of the head in the pelvis, and subsequent to the delivery of the head. The former has been described as the Rotation, and the latter as the Restitution of the fœtal head. If the head should be placed transversely at the brim of the pelvis, since it emerges in the antero-posterior diameter, or nearly so, it makes about one-fourth of a complete rotation; but if it be placed in the oblique diameter at the commencement of labour, the rotation is little more than one-eighth of a circle.

We may here consider briefly the intent and object of the various movements known as Obliquity, Flexion, Rotation, Extension, and Restitution. By the Obliquity of the head, the smallest diameter of the head is always presented to the canal of the pelvis, that is to say, the bi-parietal diameter is never opposed to the pelvic diameters, in consequence of one bi-parietal protuberance always being lower in the pelvis than the other. The Flexion and Extension of the head moves it through the parabolic curve of the pelvis. By these movements of the head its entrance in the axis of the inlet is facilitated, and its exit through the axis of the outlet of the pelvis also. The acts of Rotation and Restitution have reference to the passage of the head and shoulders of the child through the pelvis, considered as the chamber of a screw. It is these movements which keep the long diameter of the fœtal head and thorax in the long diameters of the different planes of the pelvis.

In the Third Position, the forehead is, at the commencement of the passage through the pelvis, placed opposite the left acetabulum, and the vertex towards the right sacro-iliac synchondrosis. The fœtal head occupies the right oblique diameter, as in the first position, only the long diameter of the head is exactly reversed, the sinciput being directed forwards, and the occiput backwards.

The anterior and posterior fontanelles are at this time generally on a level, or nearly so. The sagittal suture, as the patient lies in the obstetric position, runs obliquely forwards and downwards, and upwards and backwards, just as in the first position. Passed downwards and forwards, the finger comes to the anterior fontanelle, and upwards and backwards it reaches the posterior bregma. Instead of the right tuber parietale, it is the left parietal bone which is felt lowest in the lly in these cases, as labour proceeds, the more than the forehead, so that it is easier to

FIG. 106.

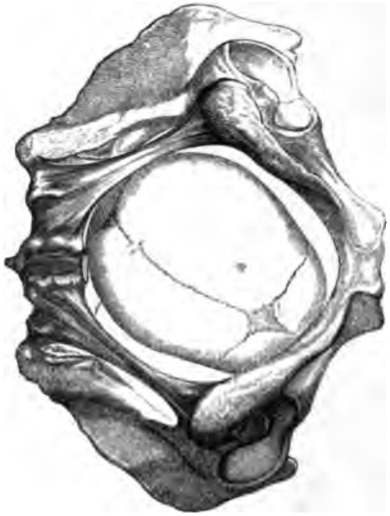


ılvis, and base of the cranium in the third position.

ior than the anterior fontanelle. When the ıced in the third position, it may take two ; from the pelvis. In one, the vertex may end, and approach towards the antero-posterior outlet, the head being expelled with the fore- pubis, and the occiput towards the sacrum. case is expelled just as it is in the oblique that the positions of the forehead and vertex, and posterior fontanelles, are reversed. If he second route, the vertex, instead of de- original position, or inclining towards the upon its perpendicular axis, and the long head passes first into the transverse diameter ıd then into the left oblique diameter. At f this change, the head exactly occupies the with the posterior fontanelle towards the ale, and the anterior fontanelle towards the synchondrosis. The modes in which these minations of the third position are effected

rocess of the ischium appears to be the deter- the ultimate direction of the head in the third position. If the occiput is driven below and behind this point, the head emerges from the pelvis in the position it held at the commencement of its passage through the pelvis, or nearly so. The forehead is in apposition with the left part of the pubic arch, and the occiput with the right sacro-iliac synchondrosis. The prominence of the occiput is in this case a serious impediment to the passage of the head over the sacral surface and through the perinæum. When the pelvis and the head are of average size, the fœtal head cannot pass in this position until it has been moulded by the pressure of the sacrum and the uterine pains. Before the head is expelled, the occiput is compressed and the cerebral mass is thrown forwards, so that when the child is born, the forehead is prominent and the occiput depressed. Some authors say that the fœtal head seldom or never passes in this direction, except when

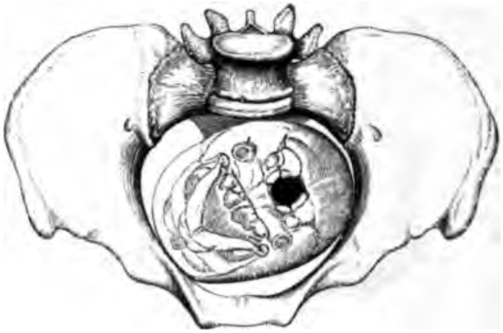
Fig. 107.



Outlet of the pelvis, and the fœtal head in the third position. The asterisk marks the presenting portion.

left oblique diameter, but the forehead is directed towards the right acetabulum, and the occiput towards the left sacro-iliac synchondrosis. Just as the third position is the reverse of the first, so this is the reverse of the second. As the head enters the brim, the occiput and the right side of the base of the fœtal head are depressed, and the right parietal bone is the lowest point. This is represented in the following figure.

FIG. 109.

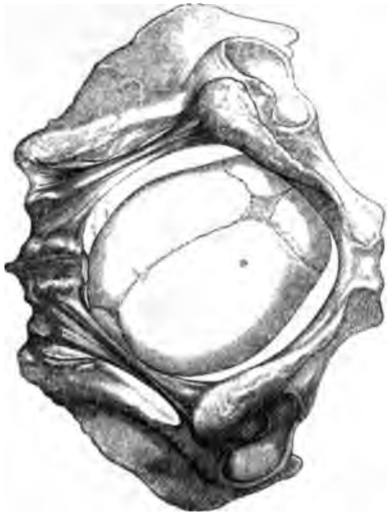


Brim of the pelvis, and base of the fœtal cranium in the fourth position.

Inferiorly, the sagittal suture runs in the same direction as in the second position; but the anterior fontanelle is divided towards the right foramen ovale, and the posterior towards the left sacro-iliac synchondrosis. The right parietal bone is the presenting portion of the head, and the part reached in examination by the finger is the anterior and upper part of the right parietal surface. As in the third position, the vertex may either pass into the hollow of the sacrum, and the head be delivered in the left occipito-posterior position, or it may advance in front of the spine of the left ischium, and be converted into the first position. The latter is the usual termination of presentations in the fourth position, just as delivery in the second position is the usual sequence of presentations in the third position.

These are the chief positions in which the head presents an passes through the pelvis in natural cases. Other varieties a enumerated by some obstetric teachers, such as the descent of the head through the upper part of the pelvis, in the transverse or in the antero-posterior diameters. This would make four other positions, since the occiput may be either on the right or left side in such cases, or placed anteriorly or posteriorly. These varieties need only be mentioned, in regard to the mechanism of natural labour, as they rarely, if ever, occur, except when the head of the fœtus is very small in comparison with the size of the pelvis, or when the pelvis is deformed, and its transverse or antero-posterior diameters considerably increased.

FIG. 110.



Outlet of the pelvis and fœtal head in the fourth position. The asterisk marks the presenting portion.

Mechanism, Position, and Motor power, in their various relations, are the Elements, or Grammar, the Euclid of the Obstetric Art. It is absolutely necessary that they should be mastered in order to practise midwifery with anything like satisfaction. I need not dwell on the difference between the state of mind of a student or young practitioner who, with a case of labour under his hands, knows the exact position of the head, and one who merely knows that the head presents, without being in the least degree aware of the position in which it may be expected to make its exit. The one will await the result with the confidence which knowledge alone imparts; the other will be disturbed with fears of something wrong, and anticipations of occipito-posterior births, when nothing of the kind is likely or possible, or with apprehensions of other complications or causes of difficulty and delay.

The positions in which the head presents are not most frequent in the order in which they are numbered in describing the positions themselves. The presentations in the First Position are more numerous than all the other positions put together. Naegelé found the first position to occur in 69 per cent. of the head presentations which came under his observation. M. Halmagrand gives 74 per cent., Madame Lachapelle 77 per cent., and Madame Boivin 80 per cent., as the proportion of the first position in head cases. Dr. Martin Barry found the first position in 256 cases out of 335 cranial cases. The variation between 69 and 80 per cent. is not very great, and as the statistics of these authors extend to 60,000 cases, we may be sure that the frequency of the presentation of the head is pretty accurately given in these results. Since the time of Naegelé's observations, the Third Position has been shown to be the next in frequency to the first. In Naegelé's own practice, he diagnosed the third position in 29 per cent. out of 1210 cases. Other authors describe the Second Position as being met with in a greater proportion than that given by Naegelé, and they place the second position as being the next in frequency to the first. Naegelé explains this by supposing that the occurrence of the third position is frequently not ascertained until it has changed into the second position, and it has then been considered to have been the second position originally. This is in all probability the truth. Madame Boivin describes the second position as occurring in 19 per cent., and Madame Lachapelle in 21 per cent.; while Naegelé, out of more than 1200 cases, found it only in ·07 per cent. Dr. Simpson remarks that Naegelé's observations were made by himself, while those of Madame Boivin and Madame Lachapelle were made by females attached to the Maternité Hospital of Paris. We may, then, conclude that Naegelé's to be the presenting part in the first and fourth positions, as the head passes through the brim and upper part of the pelvis, because it is the lowest point met with on introducing the finger into the vagina. It is, however, more frequently—indeed, almost invariably—felt through the anterior wall of the cervix, and not within the ring of the os uteri, unless after the full dilatation of the latter. I would suggest that it would be best to define the presenting part, in every kind of cranial position or presentation, as that portion of the fœtal head felt most prominently within the circle of the os uteri, the vagina, and the ostium vaginæ, in the successive stages of labour.

We may consider the right and left tuberosities of the parietal bones as points common to the positions in which the occiput is found either on the right or the left side of the pelvis respectively. That is, in the first and fourth positions, the occiput is in one case in the early part of labour in the neighbourhood of the left acetabulum, and in the other near the left sacro-iliac synchondrosis. In both the right tuber parietale is the lowest point of the fœtal head, in the early part of labour. In the second and third positions, the occiput is turned towards either the right acetabulum or the right sacro-iliac synchondrosis. In both, the left tuber parietale is lowest in the pelvis.

In the first position, when the os uteri is open to the extent of, say an inch in diameter, the part felt within the circle of the os is the upper and nearly the middle portion of the right parietal bone. As labour advances, the part of the head in the centre of the dilated os uteri is the middle portion of the posterior and upper quarter of the same bone. When the os is sufficiently open, the right tuber and the right ear may be felt. As the head advances through the vagina and presents at the outlet, it is the upper and posterior angle of the bone which is most prominent. It is upon these parts in succession that the tumour of the scalp or caput succedaneum is formed by the pressure of the os uteri and the other portions of the parturient canal upon the fœtal head. The tumour of the scalp formed upon the middle of the upper half of the right parietal bone by the os uteri, may be called the primary caput succedaneum. When the os uteri is rigid, this swelling marks the fœtal head very distinctly, and if the subsequent part of the labour should be easy and rapid, there may be no other tumour. If the latter part of labour should be difficult, a swelling of the scalp is formed over the posterior and superior angle of the right parietal bone. This may be called the secondary tumour. Sometimes the dilatation of the os uteri is so easy, and the compression of the scalp so slight, that no primary tumour is formed. In other cases a tumid ridge extends from the middle of the upper border of the right parietal bone to its posterior and superior angle, or even to the upper portion of the occipital bone.

In the fourth position, the part first felt within the os uteri, as the head lies in the left oblique diameter, with the occiput towards the left sacro-iliac synchondrosis, is the middle of the upper portion of the right parietal bone, very nearly, in fact, the same point as is felt in the first position. It is here that the primary tumour of the scalp is formed. The sagittal suture is, however, nearly in the direction of the left oblique diameter, the anterior fontanelle is directed towards the right acetabulum, and the posterior fontanelle towards the left sacro-iliac synchondrosis. In the first position, the sagittal suture, it will be borne in mind, runs nearly in the direction of the right oblique diameter.

It has been shown that the head, when presenting in the fourth position, may descend through, and emerge from, the pelvis in two modes. The occiput may turn towards the hollow of the sacrum, in which case the frontal bone approaches the left side of the pubic arch; or, as we have seen, the occiput may turn forwards and make a quarter, or rather more than a quarter turn, so as to approach the left portion of the pubic arch.

In the first termination, the anterior and upper portion of the right parietal bone passes first through the vagina, and emerges underneath the arch of the pubis. It is upon this point that the secondary caput succedaneum is formed. Sometimes this overlaps the posterior part of the right frontal bone, and some portion of the anterior fontanelle.

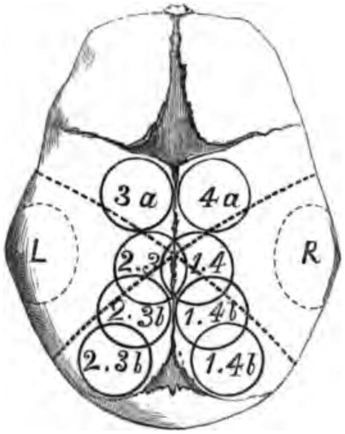
In the second termination of the fourth position, the parts of the head present in almost precisely the same order as in the first position, and the tumour of the scalp is formed in the same sites. The change is from the middle and upper portion of the right parietal bone to the posterior and upper angle of the same bone.

In the second and third positions, the presenting parts of the fœtal head and the tumours of the scalp are the same as in the first and fourth, only it is the several parts on the left parietal bone, instead of the right. In the second position, the middle of the upper portion of the left parietal bone presents in the first instance, and the movements of rotation and advance gradually bring the posterior and upper portion of the parietal bone to be the site of presentation under the left portion of the upper part of the pubic arch. In the third position, it is the middle and upper portion of the left parietal bone which presents within the area of the dilating os uteri. In the first and common termination of this position, the head, in making its quarter turn, so as to bring the occiput to the right foramen ovale, brings the same parts of the left parietal bone into presentation, as in the second position. In the second termination of the third position, the turn to the extent of one-eighth of the circumference of the pelvis brings the anterior and upper part of the left parietal bone to be the presenting part, and this is the first portion of the head to emerge under the pubis in such cases.

As the vertex is not the first part to be delivered in occipito-anterior cases, but the posterior and upper part of the right and left parietal bone, it follows that in labours occurring in the first position and in the occipito-anterior termination of the fourth position, it is the right tuber parietale which is first delivered. When this has passed through the ostium vaginæ, the circle of the outlet intersects the head between the two tuberosities in a diagonal direction. The same occurs with respect to the left tuber parietale in the second position, and in the occipito-anterior termination of the third position. So, also, in occipito-posterior deliveries, the two tuberosities do not pass through at the same time. In the fourth position it is the right, and in the third the left, tuber which first escapes. Thus the bi-parietal diameter of the head always passes through the pelvis and soft parts in an oblique direction, so that the largest lateral diameter never engages the opposite sides of the canal at the same time. (Fig. 111.)

The moulding of the fœtal head during a severe labour is peculiar in the different positions. In the occipito-posterior positions, the mass of the brain and the cranium are so moulded that the anterior or frontal end of the cranial ovoid becomes larger than the occipital. In the fourth occipito-anterior position, the right, and in the third, the left, side of the frontal region is the most prominent. In the first, and the occipito-anterior terminations of the fourth position, the head is moulded so as to make the right side of the head, and especially the right side of the occipital and posterior parietal regions the most prominent. In the second, and the occipito-anterior terminations of the third, the same prominence is impressed upon the left and posterior portion of the fœtal head. Dr. Swayne, of Bristol, has pointed out that in occipito-posterior positions, a vacant space may be felt under the pubic arch, owing to the small size of the frontal part of the head before it has been moulded by the pressure of parturition.

Fig. 111.



R. Right parietal bone. *L.* Left parietal bone.

1, 1, 1. The different points of the right parietal bone which present successively in the first position.

4. The part of the parietal bone which presents at the os uteri, in the fourth position, at the commencement of labour.

4 *a*. The part of the parietal bone which presents at the ostium vaginæ, in the fourth position, when the head is delivered in the occipito-posterior position.

4 *b*, 4 *b*. The points of the right parietal bone which present successively when the head, presenting in the fourth position, makes the quarter turn, and is delivered in the occipito-anterior position.

The figures 2, 3, 3 *a*, and 3 *b*, 3 *b*, mark, in the same way, the presenting points in the second and third positions of the head, on the left parietal bone.

The two diagonal lines across the head mark the intersection of the head by the vulva and perinæum, as the head passes out, so that only one tuber parietale occupies the ostium vaginæ at the same time.

On former occasions I have referred to the principle of the

Screw, which obtains in the pelvis, and to the Screw-like, Spiral, or Rotatory movement of the fœtal head in passing through the pelvis in the different cranial positions. It has not hitherto been made out, but I believe the mechanism of the pelvis and the fœtal head to be precisely that of a body moving down a spiral inclined plane, or screw. A screw is an inclined plane, arranged in a spiral form, either round a solid cylinder, or upon the internal surface of a hollow cylinder. When the one is fitted into the other, the spiral arranged round the solid cylinder is called the male, and that around the hollow cylinder, the female screw. In the mechanics of parturition, the pelvis plays the part of the female, and the fœtal head the part of the male screw; and it is by the movement of the one within the other, in a spiral direction, that the head passes, so as to meet with the least possible mechanical resistance from the pelvis and soft parts.

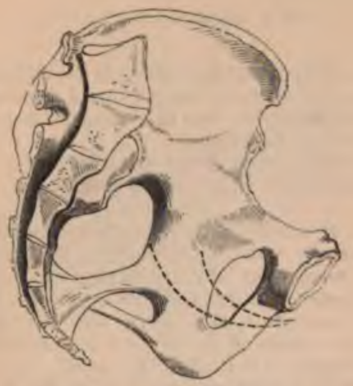
The transverse, oblique, and antero-posterior diameters are successively the longest diameters, in passing from the brim of the pelvis to the outlet. The fœtal head, being of oblong shape, can only pass by entering the brim in a position approaching to the transverse, and descending with the long diameter of the head in relation, first with the oblique diameter, and then with the antero-posterior diameter of the pelvis, or very nearly so. Such is, in reality, the direction in which the head moves. A number of pelves may be placed one above another, so as to represent pretty correctly the chamber of a female screw; and a line drawn through the long diameters of the various planes would form a spiral, and mark the path of the groove, or thread, as it is termed, of the screw. In the single pelvis, a line drawn from the transverse, through the oblique, and towards the antero-posterior diameters, would mark the path of the portion of the spiral through which the fœtal head moves in parturition. This, in the case of the first position, is somewhat more than one-eighth of a circle. The arrangement of the fœtal head with reference to the trunk favours this rotation. The spiral incline of the pelvis impresses itself upon the fœtal cranium, as the thread of the male screw, and this rotation is facilitated by the ease with which the head of the fœtusm oves upon the neck.

The pelvis represents a portion of a female screw, admitting a male screw (the fœtal head), of an oblong shape. But the male and female screws, in the case of the pelvis and fœtal head, are not accurately adjusted at all points. There is, however, a general adjustment in the shape of the fœtal head and the arrangement of the pelvic diameters. It is only at the points where the posterior part of the parietal bone, or of the occiput, comes in contact with the planes of the ischium and pubis, that the thread of the male screw bites, as it were, the thread of the female. It is here that the spiral direction is impressed upon the fœtal cranium. The line of this portion of the spiral or screw may be made out by chalking the salient point of the fœtal head, and moving it through the pelvis in the direction it takes in parturition. The chalk line marked upon the pelvis by this proceeding will show, accurately, the track of the segment of the thread or groove of the female screw, through which the prominent portion of the head passes.

The two halves of the pelvis also represent portions of two screws, the inclined planes of which are arranged in opposite directions. Thus, if the head be placed in the second position, the spiral movement is reversed from that which obtains in the first position, and the long diameter of the fœtal cranium moves from the transverse, or the left oblique, to the antero-posterior diameter. In the case of labour occurring in the first, the right shoulder moves upon the right portion of the spiral or screw formed by the right ischium and pubis, and glides down it, just as the head does in the second position. In the second position, on the contrary, after the delivery of the head, the left shoulder rotates upon the planes of the screw or spiral of the left side of the pelvis, and passes out with a movement similar to that which belongs to the head in the first position.

Perhaps the screw or spiral motion is seen still more distinctly in the common terminations of the third and fourth positions. Here, rather more than one-fourth of a circle is completed in the movement which brings the occiput from the right or left sacro-iliac synchondrosis, to the right or left ramus of the pubic arch. The movement is distinctly spiral, only that when the head presents in the occipito-posterior position, it has to pass through a spiral having a larger diameter than when the head presents in the occipito-anterior positions. The two lines marked upon the following diagram mark the different paths through which the head glides when it presents in the first and fourth position, and passes towards the antero-posterior diameters. In both it is distinctly screw-like, or spiral. A similar diagram of the right side of the pelvis would give the lines of the spirals traversed by the head in the second and in the third positions, when the head is born in the occipito-anterior position.

FIG. 112.



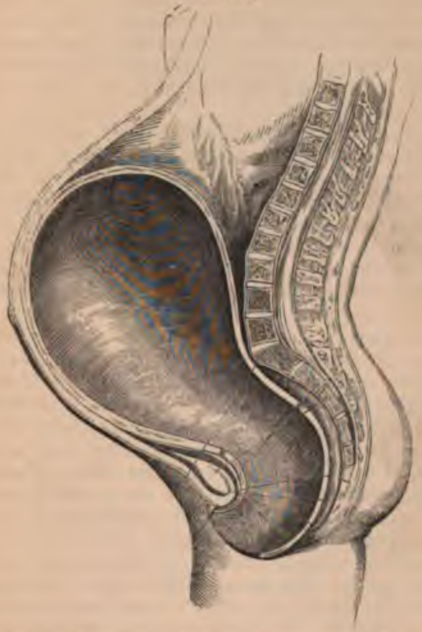
Outline of the internal surface of the left half of the pelvis. The two curved lines mark the path of the head in the first, and in the occipito-anterior termination of the fourth positions.

The contractions of the uterus and abdominal muscles constitute the *vis à tergo* which moves the fœtal head down the planes of the ischium and pubis. No rotatory movement appears to be given to the fœtal head by the pains. The spiral direction depends entirely upon the portion of the spiral inclined plane formed by the osseous surfaces. If any weight or pressure be placed upon a male screw, adjusted in the chamber or box of the female, it has the tendency to descend the spiral plane. We see this familiarly exemplified in the press for stamping letters, in which a weight at the top of the screw causes it to descend. In practice, these considerations are important with reference to the direction in which traction can be used to the greatest advantage in delivery by the long or short forceps; in rectifying the position of the head in the case of presentations in the third and fourth positions; and in other operative proceedings.

In the Stage of Dilatation, the os uteri is opened, so as to admit the passage of the fœtal head.

In this process of expansion, the os and cervix uteri are to a certain extent obliterated, and the uterus and vagina become one continuous canal. (Fig. 113.) In a preceding chapter (page 283) I have dwelt on the mode in which this dilatation is effected, partly by the influence of the contraction of the body and fundus upon the os uteri, partly by the fluid pressure of the amniotic bag, and partly by the active dilatation and relaxation of the circular fibres or imperfect sphincter of the os itself.

Fig. 113.



The cavity of the uterus, with the parturient canal in a state of full dilatation.

The direction in which the motor force of the uterus is at first exerted is downwards and backwards, in the direction of the axis of the uterus, and the axis of the inlet of the pelvis. The dilatation of the os uteri tends, by reflex action, to dilate the cardia, and this often goes on to such an extent as to produce actual vomiting. When the stomach is emptied of its contents, the freedom of the respiratory movements is increased, and the dilatation of the parturient canal is promoted. Sickness is sometimes present during the whole of this stage, but, if not, it frequently appears at the time of the complete dilatation of the os uteri.

It is not a little remarkable, that in the early part of the stage of dilatation, the excitor nerves affected by the pressure of the membranes and fœtal head should be chiefly in relation with the lower medulla and the uterus, while those which come to be excited at the time of full dilatation of the os uteri should affect the medulla oblongata, and the muscles engaged in the act of vomiting, including a considerable number of the muscles of respiration. Another singular affection of the muscular system now occurs. A very distinct shivering, or rigor of the muscles, is often observed at the time when the os uteri is completely dilated. This rigor is very similar to the shuddering produced by the dilatation of other sphincteric muscles. Many persons experience this when the first morsel of food at a meal is passing the cardia, when the urine first passes in micturition, when a catheter is passed, or when the sphincter ani first dilates. These rigors, accompanying the full dilatation of the os uteri, are sometimes so severe and continued as to excite alarm, lest they should pass into general convulsions; and this is, in fact, one of the modes in which the invasion of the puerperal convulsion sometimes occurs. The last act of the stage of dilatation is the rupture of the membranes, and the entire or partial discharge of the liquor amnii. The membranes having acted as an efficient dilator of the os uteri, as far as it dilates by mechanical distension, suddenly give way, and the uterus becomes smaller in compass, contracting more closely and powerfully upon the fœtus. As long as the membranes are unbroken, the circulation in the uterus is not materially interfered with, and the contractions are not so powerful as they afterwards become, on account of the disadvantages under which the uterine fibres act. But as soon as the waters are discharged or diminished, the uterus contracts more closely upon the fœtus, and prepares itself for the stage of propulsion, which we shal next have to consider. The circulation in the uterus, and consequently the changes going on in the placenta, are then considerably interfered with; so that the stage of propulsio is of much greater moment to the life of the fœtus than th stage of dilatation, which is now brought to a conclusion.

In the Stage of Propulsion, the presenting part of the chil is passed on from the middle portion of the pelvis to th ostium vaginæ. At the time when this stage of labour commences—namely, the point at which the liquor amnii is discharged, and the os uteri becomes fully dilated, the moto force of parturition is applied in quite a new direction. Th direction in which the fœtus has now to pass is in that o the axis of the lower part of the pelvis, which is forwards an downwards. It is at this point that the expiratory muscle come into play, particularly the abdominal muscles, and thu the new direction is provided for. Before the dilatation o the os uteri, we had to consider the fœtus as an ovoid mass and the axis of this ovoid corresponded with the axis of th uterus, and the axis of the inlet of the pelvis. After th dilatation, we may speak of two axes of the fœtus—one, th axis of the head, in its long or occipito-mental diameter; th other, the axis of the body of the fœtus. Now, the axis o the head, in a natural presentation, becomes nearly the sam as the axis of the outlet of the pelvis, through which it ha to traverse; and the fœtal body being flexible, readily passes as it descends, from the direction of the superior to that o the inferior pelvic axis. All these correspondences cannot fai to strike the attention, but they are only a few of those whic accompany this stage of parturition. I have already mentioned the advantage given to the uterus by the rupture o the membranes. The same circumstance is equally favourabl to the action of the abdominal muscles. A further adaptatio therefore, becomes visible in the precise time at which th liquor amnii is discharged. When the bulk of the uterus increased by the liquor amnii in addition to the fœtus, t abdominal muscles are so distended that they can only a with difficulty. But after the diminution of the size of t uterus by the discharge of the waters, the abdominal musc are more free to act, and it is now that they are called up to aid in the expiratory actions which propel the head of child through the vagina. When voluntary movements expiration are unadvisedly made during the stage of dilatat and easy and composed after several hours of severe labour, complaining of nothing beyond the mere soreness of the muscles consequent upon their energetic contractions.

It may be well to describe minutely the motor phenomena of the contractile part of a pain in this stage. At the coming on of each pain, the patient takes a deep inspiration, as a preliminary. Expiration then takes place slowly and forcibly, in a succession of gasps, and when the air in the thorax is diminished, it is suddenly removed by hasty inspirations. Each pain consists, as far as the respiratory muscles are concerned, of several sudden and deep inspirations, followed by prolonged and laborious expiratory efforts, with the glottis partially or entirely closed. At the acme of a pain in this stage of labour, the glottis and cardia are entirely closed, the glottis only opening partially at intervals, and the abdominal and all the other ordinary and extraordinary muscles of expiration being forcibly contracted. The diaphragm remains inert, as in vomiting, with the actions of which, except that the cardia is closed instead of opened, the efforts of the expiratory muscles in labour may be compared. Obstetric writers have taught that the diaphragm contracts in this stage; but if it be considered for a moment that the diaphragm is a muscle of inspiration, while the actions of parturition are expiratory, the fallacy of such a view of the action of the diaphragm must at once appear. Of the contraction of the abdominal muscles during this stage of labour there can be no doubt; and the actions of the diaphragm and abdominal muscles are antagonistic. It is true that the floor of the diaphragm, instead of being arched, as in an ordinary state of relaxation, remains plane, during the efforts of inspiration, with the glottis closed; but this is from the mechanical distension of the chest by the contained air, not from an active contraction of the muscle itself. Besides these actions, which are involuntary and reflex, the patient voluntarily aids in fixing the thorax by holding some fixed body with her hands, or planting her feet firmly. More than this, she increases all the expiratory actions by strong efforts of the will, and by that emotion of labour which impels her to brave every suffering to effect the birth of the child. At length, when the pain can no longer be borne, the short gasp or groan is exchanged for a cry which dilates the glottis, and the pain and contractions subside. This cry is a motor action, excited by the emotion of pain, and instantly relieves the uterus parts endangered. The dilatation of the sphincters is partly dependent on the sensation and emotion of severe pain, and partly on the reflex dilatation peculiar to the sphincteric muscles. This view of the subject gives importance to the defecation, which frequently occurs at this time, and which has been looked upon only as a disagreeable *contretemps*. Physiology here, as in many other instances, transmutes the meanest actions of the economy, and renders them noble by virtue of their uses. At the same moment that the orifices of the rectum and bladder are thrown widely open, there is generally a dilatation of the glottis. Even from women who restrain the expression of their emotions during the rest of labour, a cry of pain escapes at this juncture; this cry is necessarily accompanied by an open state of the glottis. The opening of the glottis is not at all accidental or voluntary, but is as regular and involuntary as its closure during the propulsive pains. Its effect is suddenly to take away the expiratory pressure from the expulsive action. Without this combined action of the glottis, and the sphincters of the rectum and bladder, for the defence of the ostium vaginæ, recto-vaginal laceration must be a more common accident of parturition. Such would inevitably be the frequent result of closure of the abdominal and thoracic cavities at all points, except that of the point of exit for the fœtus, in the final throes of labour.

Altogether, it must be conceded that parturition is the most voluminous of all the motor functions. The human uterus contracts sometimes sufficiently to render the hand of a strong man powerless. In order to illustrate the wonderful muscular power of the heart, the circulation of the whale or the elephant is often referred to by physiologists; but enormous as is the power of the heart in these animals, the parturient actions by which they must bring forth their enormous young give us the most colossal idea we can entertain of any single muscular action. In the human subject, there is a certain grandeur in the combined efforts brought into play in parturition. In women, even of moderate strength and stature, every voluntary muscle of the body is in strong action; the excito-motor force is in a state of the greatest activity; the uterus, unseen, and without any participation with the will, is making its immense contractions; and emotion imparts strength to both voluntary and reflex actions. A temporary calm follows the energetic actions which issued in the delivery of the mother. After the excessive action in which nerve and muscle seemed strained to the utmost pitch, there comes a sudden and profound repose; there is perfect freedom from pain; every fibre is relaxed; only the uterus now contracts of all the muscles which were so lately struggling. Like some ship which turns from a tempestuous sea into a safe and quiet harbour, the new mother passes from the storm of childbirth into the tranquil haven of maternity. In the pathetic words of Scripture, "A woman when she is in travail hath sorrow, because her hour is come: but as soon as she is delivered of the child, she remembereth no more the anguish, for joy that a man is born into the world."

In the Supplemental Stage, the placenta is detached and thrown off, and the uterus contracted, so as to prevent the occurrence of hæmorrhage.

While the body of the child is born by the motor actions I have been describing, the contracting uterus follows closely upon it in its descent, and the action of the uterus, excited at this time from the immense irritation of the vagina by the advancing fœtus, is frequently sufficient to throw off the placenta, and lodge it in the upper part of the vagina. When the placenta is not separated in this way by the last expulsive pain, it remains quietly in the uterus until the appearance of the first after-pain. During this interval the uterus contracts with tolerable firmness, under the influence of the excitement of the act of expulsion. If the placenta has been expelled into the vagina, its presence in this situation excites, after awhile, bearing-down pains and contraction of the vagina, similar to those of propulsion and expulsion, only far more inconsiderable, generally requiring slight traction of the cord to complete its removal. When the placenta remains *in utero*, it becomes separated from the uterine surface by the contractions of the uterus, and by the arrest of the circulation in the umbilical cord. It is then removed by a miniature copy of labour itself; there is a dilatation of the os uteri, and there are the propulsive and expulsive actions of the uterus and the expiratory muscles on a small scale.

After the expulsion of the fœtus, the first act of the uterus is to contract, so as to prevent the occurrence of hæmorrhage. This contraction is induced, in the first instance, by the concluding irritation of the vagina and perinæum on the exit of the fœtus. It is subsequently insured by a succession of stimuli. Of these, some are uterine, others are extra-uterine. The bulk of the placenta and membranes irritate, in the first place, the now contracted uterine surface. When placental separation has occurred, the abraded surface of the uterus is strongly excitor; and as the placental mass passes through the vaginal passage and ostium vaginæ, excitation, which insures full uterine contraction, is supplied. It is a peculiarity of the utero-vaginal canal, that at the termination of labour all the surfaces are more instantly excitor, and the answering motor contractions become more rapid and more easily provoked. During severe labour, irritation of the os uteri, or of the vaginæ, will often increase the pains only in a moderate degree; but now, the introduction of the hand into the vagina, and irritation of the os uteri, will excite instant and forcible contraction of the uterus. The extra-uterine excitors of uterine action also come into play in a remarkable manner. As soon as the child is put to the breast, the slight irritation of the mammary excitor nerves excites distinct contractions of the uterus. This reflex relation from the breast to the uterus continues for several days after parturition, until, in fact, the uterus has returned to the natural state. When the secretion of milk is established, there is, at every afflux of blood to the breasts causing the sensation termed by women "the draught," an answering contraction of the uterus. A reflex relation between the stomach and the uterus is also now set up. Every time the patient drinks her gruel, or takes her tea, sharp contractions of the uterus, after-pains, in fact, are excited. Emotion is another aid to the permanent contraction of the uterus. Any emotion of the mind will generally produce an after-pain, but the maternal emotion especially. The emotion produced in the mind of the mother by suckling her infant induces contraction. A day or two after labour, merely presenting the infant to the mother, without its actual application to the breasts, will excite the sensation of the draught in the mammæ, accompanied by a sudden secretion of milk, and also by contraction of the uterus. Thus the close of labour, the return of the uterine system to the quiet of the unimpregnated condition, is as plentifully provided for as the commencement, or any of the various stages of the process. For some days after labour, the contraction of the uterus is of an active sphincteric kind, but its vascular and other tissues rapidly diminish in size, and it soon becomes, to a great extent, a non-motor organ, as before the time of conception.

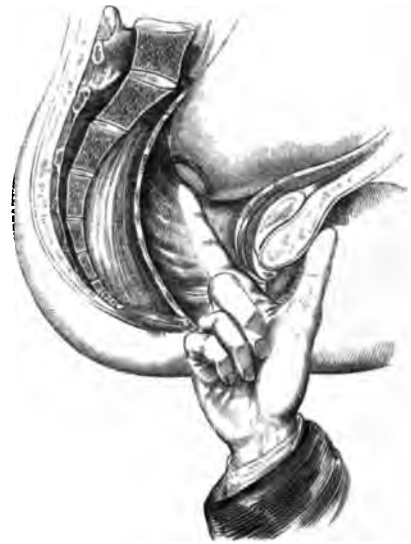
ference, with a view to the safety of the mother or the fœtus. But in the most natural cases, it is always a comfort an ground of confidence to the patient, and a satisfaction to th accoucheur, to know that everything is "Right," as the phras is when the fœtal head presents.

The usual obstetric position in this country is that in whic the lying-in woman is placed on her left side, with her hea upon a pillow, and the thighs and legs flexed. She should b placed with her back towards the edge of the right side o the bed. In the Stage of Dilatation, before the os uteri ha opened, and when the pains are not immoderate, the patien may be allowed to choose her own posture, except during a examination. She may walk about, and occupy herself wit the preparations for the coming infant, or other casual matters The pains may be borne in a sitting or standing position, a may seem most easy. No voluntary efforts or straining a this time should be permitted. The more freedom we allow of course in moderation, to the patient during this stage, th less fatigue she will feel during the succeeding stages o labour. When the stages of propulsion are proceeding, sh should be advised to lie upon her left side in the manne already pointed out. This seems to be the most convenient position, and one often assumed by patients naturally or in cases where women are delivered without assistance But even after the stage of dilatation has passed, no grea constraint should be exercised. If the labour be long, wome become cramped and sore from continuing several hours i the same position, and the pressure exerted by the fœtus i more distressing than when occasional change of posture i allowed. Amongst poor women in this country, the usua dress is worn until the completion of labour. With the rich the custom is either to wear a dressing-gown during th stage of dilatation, or to remain in bed during the whol of labour. The bed should be prepared by the nurse with drawn sheet, and a leather, or piece of india-rubber sheeting to defend it from the discharges.

In "Taking a Pain," as it is termed, the accoucheur sits stands by the side of the bed, the patient's back being towar him. This is one advantage in the position on the left sid as it enables the attendant to make the necessary manipul tions while her face is turned away from him. With expert and careful nurse, the patient will be placed on side, and the clothes so arranged that a little fold of chemise or night-dress will be brought to the edge of the bed, along which the accoucheur can introduce his hand without impediment until it reaches the vulva. Otherwise, the dress may be wrapped round the legs, and the attendant has to disentangle it before he can make the necessary examination. The position of the hips is obvious, and the better plan for the student is to introduce the right hand between or at the back of the heels, and pass it up towards the nates. The posterior fourchette should be felt for, the vulva separated by the two forefingers or the finger and thumb, and the forefinger introduced along the vagina in the direction of the axis of the pelvic outlet. The experienced accoucheur will have little difficulty in passing his hand straight to the vulva without any such precautions. Guiding the finger along the vagina, the os uteri is felt, in the early part of labour, pointing towards the upper part of the sacrum, and the presentation can be made out as described when treating of the mechanism of labour.

If the os uteri cannot be reached with the forefinger of the right hand, the two forefingers of the left hand should be introduced, as they can be passed higher than the forefinger of the right hand. Some distinguished obstetricians always use the second finger of the right hand, because of its length; others, the two first fingers of the same hand, with a view to trying the dilatability of the os uteri and vagina. As a rule, no opinion respecting the presentation should be given unless the finger can be passed within the os uteri, and the presenting part felt, either by itself or through the membranes. If the young accoucheur contents himself with feeling the presenting part through the anterior wall of the cervix uteri, without getting within the os, he may sometimes mistake the back or shoulder for the head, and have to make some awkward explanations to the patient or those around in case of such an error. Besides ascertaining the exact presentation, we acquire by the first examination a knowledge of the state of the os uteri, the extent of its dilatation, its dilatability, the condition of the vagina and perinæum as regards sensibility and distensibility, the amount of lubricating secretion in the passages, the state of the rectum as regards fulness or emptiness, the capacity of the pelvis, and some general idea of the size and state of ossification of the fœtal head, the tumour of the scalp, the rupture or integrity of the membranes, the quantity of liquor amnii, the height of the presenting part in the pelvis, &c. In all examinations, the fingers used should be smeared with cold cream, olive oil, or glycerine. As a general rule, the forefinger is the one most conveniently used by the accoucheur, but no representation which I have seen accurately portrays the mode in which it is used in an examination. In an examination in the early part of labour,

FIG. 114.



Examination in the stage of dilatation.

when the os uteri is high in the pelvis, the arm and wrist are rotated so that the palmar surface of the base of the finger comes almost in contact with the pubis, and the os uteri is explored with the radial and middle surface of the palp of the finger. (Fig. 114.) This is, I believe, accurately represented in the accompanying engraving. In examinations in the latter part of labour, when the os is dilated and the head low down, the finger may be used in almost any direction with equal ease.

expected to give some idea as to the time when the delivery may be completed.

A labour is considered natural as regards time when it does not exceed twenty-four hours from the commencement of the dilatation of the os uteri to the completion of delivery. Primiparous women frequently, however, exceed this period, and multiparous women are commonly delivered in a much shorter space of time. The full dilatation of the os uteri is considered to occupy five or six hours, but in many cases it takes less, and in others more than this. The bony pelvis being normal and the pains natural, labour is quick in proportion as the os uteri and perinæum are dilatable, and the vagina short and capacious; and tedious according to the rigidity of the os uteri and perinæum and the length and contraction of the vagina. Sometimes one portion of the parturient canal is relaxed, and another contracted; under these circumstances, one part of the labour will be rapid and the other slow and tedious. It is only by experience, tact, and an appreciation of all the circumstances which modify the progress of labour, that anything like certainty of prognosis as regards its duration can be acquired. In parts previously rigid, the disposition to dilate may be suddenly manifested; or the os uteri, after dilating favourably to a certain extent, may become immoveable. As regards uterine contractions, we may have a sudden failure of active pains, or pains in cases which have been sluggish may become as suddenly energetic. It behoves, then, that the young practitioner should, as the rule, be almost as guarded as an oracle in his vaticinations respecting the time of the termination of labour in any given case.

During the Stage of Propulsion, we may moderate and guide the pains by inducing the patient to cry out if the pains are excessively violent during the expiratory efforts, or to hold her breath, and add voluntary straining to the reflex actions of the respiratory muscles, if the pains are feeble. In thus managing the open or closed state of the glottis, we can always increase or diminish at will the force of the uterine and respiratory contractions. As a rule, the membranes are ruptured spontaneously at the commencement of this stage. We should be especially careful not to rupture them in ordinary cases before full dilatation of the os, if we can avoid it. When the stage of propulsion is fully formed, we may generally rupture the bag with advantage if this has not already occurred. This may be done by the nail of the forefinger during the height of

a pain. When the membranes are tough, several efforts
successive pains are necessary before the membranes
broken, but no violence should be used. Sometimes ca
met with in primapara in which the quantity of liquo
is so small, that it does not, from its bulk, interfere w
uterine action, and in which the labour goes on so s
torily, that it is advisable not to rupture the membran
the perinæum is dilated, and the head presents at the
vaginæ. When the amount of fluid is large, it ver
facilitates the progress of labour to evacuate it as soon
os uteri is fully dilated, or even before this period.
membranes are punctured, accidentally or intentionally
the liquor amnii is not in excess, before the stage of dil
is completed, it frequently happens that the os uteri,
had been dilating most favourably, becomes rigid an
tracted, and labour is impeded for several hours.
other hand, cases are occasionally met with in which t
dilatable but the uterus inactive, and in which dilatati
be promoted by the evacuation of the liquor amnii; bu
are exceptions to the general rule. There is another
the management of the liquor amnii worthy of noti
sometimes happens that the head is well engaged
pelvis before the liquor amnii begins to escape, and t
portions between the head and the parturient canal
exact, that no water flows away in the intervals betw
pains, or during the greater part of the pains themselve
head and canal act exactly as a ball-valve, and no fl
pass except at the acmé of a pain, when the force which
advance the head is expended in a slight dribbling
waters. Much time is often lost in this way, and t
mode of obviating the difficulty is to drain off the
amnii through a small gum-elastic catheter passed up
side of the head. Nausea and vomiting are always be
during the progress of natural labour. In the stage o
tion they aid in dilating the os uteri by the me
straining which occurs, as well as by the reflex sy
between the cardia and the os uteri, and the general
effects of sickness. In the stages of propulsion and ex
also, they increase the expulsive efforts, and relax the
and perinæum.

When the dilatation of the os uteri is very diffic
margin of the os being hard, thin, and painful, nau
doses of tartar emetic are very useful. The inhala

chloroform also has a very beneficial effect in cases of rigidity. Sometimes, when the tenderness and spasmodic rigidity of the os uteri is very great, and when chloroform is not administered, an opiate will be of great service; or a moderate bleeding may be practised when the patient is of plethoric habit. I have tried belladonna, and a solution of atropine, in such cases, but without any marked effects. During the stage of dilatation, and in the early part of the propulsive stage, the direction of the axis of the uterus should receive special attention. It should be as far as possible kept from anteversion, retroversion, or obliquity on either side, as these departures from its proper axis are certain to impede labour.

From time to time, during every labour, the condition of the fœtal heart should be ascertained. This can easily be done by means of the flexible stethoscope mentioned as one of the requisites of the accoucheur, and the knowledge thus acquired will sometimes become of great use in labours apparently the most uncomplicated. The accoucheur should never forget that in a case of labour, two lives are under his care, and that both require his attention. In no point is the excellence of the Dublin school of Midwifery more unequivocally shown than in the care with which its best teachers advise that auscultation of the fœtal heart should invariably be practised during the progress of labour where the child is living.

The spirits of a lying-in woman should be kept up as much as possible, and this is best insured by cheerfulness and composure in those around her. The lying-in room should not be crowded, and from time to time the accoucheur should retire, so that no constraint may be placed upon the bowels or bladder of the patient. She should be allowed very nearly her usual diet, in the early part of labour, if her stomach can bear it, and there is no special contra-indication.

In the Stage of Expulsion, the chief points are, the regulation of the expulsive forces, the direction of the head, and the preservation of the perinæum. In the latter part of labour, the glottis is to the parturient function almost what the safety-valve is to the steam-engine. By opening the glottis, as by directing the patient to cry out; or by closing it, as by directing her to hold her breath, we can, to a very great extent, regulate the expulsive efforts of the last and greatest stage of labour.

Many conflicting opinions prevail as to the propriety of supporting the perinæum. Some years ago I pointed out that it should be ascertained if the cord be twisted round the neck, and the loop should as gently as possible be passed over the head in order to free the funis from pressure. The rotation of the shoulders in the reverse direction to that taken by the face, so as to bring the shoulders into the opposite oblique direction to that occupied by the head, may be aided by placing one hand upon the back of the neck, and the other upon the sternum as the shoulders are passing. As the body of the child passes, it should be carried up somewhat over the pubis. These aids can only be afforded after an accurate knowledge of the mechanism of labour has been acquired, but they may then be made very considerably to facilitate the progress of delivery.

The old axiom, "Meddlesome Midwifery is bad," has had great force in obstetric practice, but it is, perhaps, better adapted to ignorance or partial knowledge, than to a perfect comprehension of the mechanical and motor phenomena of natural labour. I have no doubt the time will come when both will be so well understood that the finger and mind of the accoucheur will be in accordance with every change in the passage of the child during parturition. Proverbs are always one-sided. The phrase quoted has, no doubt, been useful in preventing improper interference, but it has also a tendency to the prevention of interference when this is both useful and necessary.

During the propulsive and expulsive stages, it is usual for the patient to aid the respiratory efforts, by fixing her feet and pulling at a towel with the hands, or holding the hands of the nurse. This exertion must be encouraged or discouraged, according to the power of the pains. When the head is passing through the vulva, the right knee should be raised so as to facilitate its passage. Throughout the whole of labour the woman derives comfort and relief from pains in cases where anæsthesia is not produced, from pressure exerted by the hand of an attendant upon the sacrum during the pains.

After the birth of the child, the umbilical cord requires to be tied. The ligatures should be formed of thread, doubled several times. It should be tied firmly about two inches and a half or three inches from the umbilicus, and a second ligature is generally applied at a little distance from the first, towards the placenta. Considerable force must be used in tying the cord, in cases of a large funis from the deposition of an unusual quantity of the gelatinous matter constituting the hand, the fore-finger of the right being placed upon the insertion of the cord, as it is here that laceration occurs, when it gives way. Of course, if the cord is breaking, the traction should cease, and the placenta ought to be drawn forth by the fingers. As the rule, the placenta should be examined, to be sure that no portion of it remains *in utero*. Upon the removal of the placenta, the fingers of one hand should always be introduced into the vagina, while the uterus is gently squeezed by the other, and any coagula which can be found should be removed. It should always be borne in mind, that a retained clot, a shred of membrane, or a piece of placenta, may subsequently imperil the life of the patient by becoming putrid and absorbed. After the delivery of the placenta, a bandage should be applied to the abdomen, with a view to gentle and moderate compression of the uterus, and the support of the vascular system of the mother, after the tension of the abdomen during pregnancy. No doubt, by forcible compression after parturition, injury may be done to the uterus; but I have known cases of mortal fainting occur in patients where no other cause of death could be assigned than the neglect of bandaging. I therefore strongly recommend it, and all the more particularly as its employment has been questioned in recent discussions. When the bandage has been applied, the mother is allowed to rest while the child is being dressed, after which she is made comfortable by the nurse. The child should be put to the breast within a few hours after delivery, but should not suck frequently until the secretion of milk is established, otherwise the mother suffers more than is necessary from after-pains, particularly in multiparous cases.

As soon as the child is born, the first attempts at Respiration usually occur immediately, the first inspiratory movements being excited as a reflex action, by the influence of cold upon the surface. The diaphragm is the special muscle of inspiration, and this is the first to act in the establishment of respiration in the new-born infant, as it is the last to relinquish its functions, in a case of death from asphyxia.

The child may, from a variety of causes, be born in a state of Congenital Asphyxia, in which instant and energetic efforts become necessary for its restoration. The chief causes of this condition are such a continuous contraction of the uterus during labour as to interfere with the due supply of blood to the maternal side of the placenta, partial or entire placental detachment before the time of birth, and continued pressure upon the umbilical cord. The child may also be asphyxiated by being born, in the absence of the attendants, enveloped in the membranes, or "Caul," so as to render respiration impossible.

The signs of congenital asphyxia are failure of the fœtal pulse, and spasmodic movements of the presenting part of the child occurring for some time before death at tolerably regular intervals. When the child is born asphyxiated, the surface is very dark, from the injection of the capillaries with venous blood. It becomes necessary to understand the nature of the intermittent spasmodic movements just mentioned, with a view to treatment. When the blood of the fœtus becomes entirely venous, it stimulates the medulla oblongata, as proved by the experiments of Schneider, Volkman, and others, so as to produce gasping efforts of a respiratory character. These movements are termed Centric, to distinguish them from the Excentric or Reflex movements, dependant on external stimuli. They occur *in utero*, in precisely the same way as when the fœtus is exposed to the external air.

The first movements of children who are born in a state of asphyxia, and who are recoverable, are of this kind, and these centric movements will sometimes of themselves slowly establish healthy respiration, the intervals between the gasping efforts becoming smaller, and the movements themselves becoming changed into the ordinary reflex respiratory movements. It is seldom that a child can be restored after the cessation of these centric movements, notwithstanding that the heart will frequently beat for some time after they have ceased. The younger the fœtus, the longer is the time occupied in the act of dying, and the greater the chance of resuscitation.

The ordinary means of establishing respiration in cases of partial asphyxia consist of sprinkling cold water on the face or chest of the new-born child; slapping it on the sides or breech; pinching the ears, or irritating the eyelids or anus; rubbing the nares and mouth with a little brandy or sal volatile. If the child is very black, a small quantity of blood should be allowed to flow from the umbilicus before tying the cord. In more serious cases, or when the above means are not sufficient, the child is generally put in a bath of about the temperature of the blood, or wrapt in warm flannel and kept near a fire. Alternating with this raised temperature, the child should be sprinkled with cold water, and the limbs and body of the child rubbed assiduously with brandy or spirit. Great care should be taken, in all cases of asphyxia in new-born infants, to cleanse the mouth, nares, and fauces. Artificial respiration may be practised, either from mouth to mouth, or by means of a tube inserted into the mouth or nostril. During these operations the thorax should be alternately squeezed by the hand, and allowed to relax. Artificial respiration is not, however, of so much value in congenital as in other forms of asphyxia, from the fact that the fœtal lung has never been distended with air. The plan suggested by Dr. Marshall Hall has excited much attention of late, and is said to have been successful in a great number of instances. If it should prove efficacious in cases otherwise irrecoverable it will become an invaluable boon. Dr. Hall's method consists in placing the fœtus on its face, with the forehead raised, and rotating it from side to side, so as to induce movements similar to those of natural respiration, and to favour the escape of mucus from the air-passages. These movements should be combined with continuous frictions of the limbs, so as to keep up the circulation as well as possible in the absence of respiration. In cases of congenital asphyxia, when the child has been recovered, the child should be watched carefully during the first twenty-four hours of life, as there is a tendency to the occurrence of what has been termed secondary asphyxia; and the child will frequently be observed to change colour from imperfect oxygenation of the blood. Frictions, and the free exposure of the child to the air, are the best means of preventing this accident. Dr. Hall is opposed to the use of the warm bath in resuscitation from asphyxia, on the ground that it produces faintness and exhausts the remaining powers of life.

CHAPTER XXV.

MANAGEMENT OF THE PUERPERAL STATE.

In the Puerperal State, the patient has to recover from the shock of labour itself, and to pass through the disordered conditions, incident to the state of the uterine cavity and the walls of the uterus after parturition, and to the establishment of the mammary secretion.

The influence of the shock of labour is visible in the lowered state of the pulse which obtains some hours after labour, the debility felt by the patient, and the intolerance of light, noise, and other stimuli previously borne with ease. The shock itself depends on the exhaustion of the nervous system by the prolonged muscular efforts, the physical pain, the loss of blood during the separation and expulsion of the placenta, and the removal of the pressure exerted by the gravid uterus in the latter months upon the other organs of the body. The influence of the shock of parturition is best relieved by an opiate when the labour has been severe, or by natural sleep, quiet, a darkened room, and the prevention of all excitement as far as possible. If the patient be greatly exhausted by labour, stimulus and nourishment may be administered immediately after delivery; but in ordinary cases, gruel, beef-tea, tea and dry toast, or similar matters, should be allowed during the first twelve hours. I give an opiate immediately after labour, or at bedtime, if delivery has been completed in the afternoon or evening, and there is no special contra-indication.

After the completion of labour, the most important considerations respecting the child-bed patient, are those which relate to the internal surface of the uterus. When describing the gravid uterus, I dwelt upon the involution of the muscular structure of the organ after parturition, by the degeneration, disintegration, and removal of the large muscular fibres, and the substitution in their place of the rudimentary cell-fibres proper to the uterus in the unimpregnated state, so that it is not in this place necessary to refer further to the post-partum changes in the parietes of the organ.

If the portion of the internal surface of the uterus be examined within a few days after labour, it is found to be raised somewhat above the other parts of the uterus, because of the increased thickness of the organ in this situation, and the remains of the decidua serotina. The open mouths of the veins are still visible, and small pieces of coagula are hanging from them into the cavity of the uterus. Since the time of Harvey, who was one of the earliest to make the comparison, the state of this part of the uterus after parturition has often been likened to a stump after amputation, or a new-made wound. The comparison is only correct to a limited extent. The small, curling arteries and the veins of the uterus have certainly been divided in the separation of the placenta, but, except at these points, no structural lesion occurs. The

idua, from the organ studded with patches of
ompletely covered with this membrane, to the
ooth internal uterus, from which the whole of the
been detached; and I look upon this exfoliative
f the mucous membrane or uterine decidua, as in
pects analogous to the change which takes place in
ne mucous membrane at the catamenial periods, and
hial and menstrual discharges appear to be essentially
ne, except that the lochial flow is more profuse than
enstrual. In animals, there is no lochial discharge in
sense in which this discharge occurs in the human sub-
, because the placental cotyledons, or that portion of the
centa which fulfils the function of the decidua in the
uman subject, are permanent. No doubt the basement or
erminal portion of the uterine mucous membrane remains
both after the catamenia and the lochia, and produces the
new mucous membrane, found after menstruation and par-
turition. At first the lochial discharge is of the colour of pure
blood, mixed occasionally with coagula. It is passed with
the greatest readiness during the times of micturition and de-
fecation, or while the uterus is contracting, as in after-pains.
After a few days, the sanguineous character of the discharge
diminishes, the flow becoming greenish, and frequently having
a disagreeable smell. It is now called the "green waters,"
and the next change is to a whitish secretion, which gra-
dually ceases. The green colour is caused by the chemical
action of the utero-vaginal secretions upon the diminished
amount of blood-globules now present in the discharge. The
lochial discharge possesses a peculiar smell, similar to that of
the catamenia, but more intense.

It is of importance that the lochial discharge should be fre
In the event of deficiency, from retention in the uterus or
gina, friction of the abdomen should be practised, wit
view to excite contractions of the uterus and the expulsio
any collections in its cavity. Warm water, infusion of
mile flowers, or a weak solution of chloride of lime,
be injected into the vagina two or three times daily,
cases where actual mischief is apprehended, the cavit
uterus itself may be washed out. Napkins are wo
he whole continuance of the lochial flow, and
change them frequently. The change of the
hial flow, besides being necessary t
harges very speedily decom

come intensely disagreeable. I have sometimes been obliged to order a bag of animal charcoal, or a piece of prepared charcoal sheeting, to be placed in the bed to neutralise the lochial effluvium.

The After-Pains are the natural attendants upon the uterine contractions which occur after parturition. The uterus is usually felt in a state of persistent and moderate contraction; but from time to time this contraction is increased, and is attended by pain. After-pains increase in severity with every labour; so that primiparous women suffer little from this cause, while multiparous women are troubled with them in proportion to the number of children they have borne. They commence soon after labour, and in the worst cases last three or four days, being produced spontaneously, or by any reflex irritation, such as the draught in the mammæ, the sucking of the child, taking food or drink into the stomach, and the action of the bowels or bladder. Within certain limits, these pains are very salutary, tending to the expulsion of irritating materials from the uterus, and the perfect Involution of the organ, as the reduction of the organ to its proper size is called. Sometimes they occur violently two or three days after the completion of delivery, when the finger should be passed into the vagina, and the os uteri examined, with a view to the removal of any coagula which may remain in the uterus and vagina. When no retention exists, but the pains are neuralgic in character, an opiate, and a warm linseed-meal poultice upon which a little laudanum has been sprinkled, applied to the abdomen, afford great relief. I have sometimes found that an anodyne embrocation applied to the breasts is of service in relieving distressing after-pains. The reflex sources of uterine irritation should be avoided as much as possible. When severe and long-continued, after-pains can never be neglected with impunity, as they sometimes run on to inflammatory disorder.

In most women there is some appearance of Milk in the breasts before the coming on of labour. The areola acquires its deepest shade during and immediately after parturition, and at this time, in women of dark hair and complexion, an almost black zone surrounds the nipple. There is sometimes a pretty free secretion of milk from the beginning, but it is generally the third day before the secretion is fully established. The mammary secretion is, without doubt, dependent upon the internal condition of the uterus already described, being

reflex phenomenon by uterine irritation. The
rn excite the uterus, and these organs mutually
to the return of the uterus to the unimpregnated
and to the establishment of the mammary secretion.
milk is first secreted in quantity, there is a great
ation of blood to the glands, producing considerable
in, and swelling, which lasts for two or three days
urable cases. The mammæ often become greatly dis-
l, not only from the secretion and retention of milk, but
tumefaction of the gland itself. The milk first se-
ed, termed the colostrum, is more irritating than that
sequently formed, and acts as a natural aperient, clearing
e bowels of the child from the remains of the meconium,
s the secretions accumulated in the intestines during fœtal
ife are called. Sometimes women suffer considerable pain
from the mere weight of their breasts, in which case they
require to be supported by a bandage placed round the neck.
As soon as the milk is secreted plentifully, the child should
be put frequently to the breasts, and they should, besides, be
drawn, if necessary, by the nurse, so as to prevent accumulations of milk in the ampullæ, or the galactophorous ducts.
Frequent frictions with olive oil, or a mild camphorated liniment, are also very useful, as favouring the flow of milk
through the tubes, and diminishing the tumefaction of the
glandular lobules. If the breasts are very hot and painful,
an evaporating lotion should be applied constantly. The
nipple should always be wiped carefully after each drawing
of the breast, or the sucking of the infant. As regards the frequency of the application of the child to the breasts, a certain
amount of caution should be observed. If there be a profuse
secretion, and the glands are not relieved, inflammation and
suppuration occur; if the child should be applied too fre
quently, the secretion is greatly increased, as each act of suc
ing is at once a relief and a stimulus to the gland, and t
patient may be weakened by galactirrhœa. Again, if
glands are swollen, but without any great secretion of
and the child is constantly applied, great pain is prod
and the tubes and glandules may become acutely inflam
may suppurate from this cause. Mammary abscess du
puerperal month may arise from three causes:—1,
tation of sore nipples; 2, the distension of the
portion of its substance and tubes; or 3, the
secreting gland, by constant attempts

under-fed during the puerperal period. Most of the cases of puerperal mania which I have seen, have resulted from exhaustion produced from various debilitating causes, such as under-feeding, over-nursing, and want of sleep, during the first two or three weeks after labour.

Rest, especially in the early part of the puerperal state, is of great moment. Those who get up too early, suffer from hæmorrhage and prolonged lochial discharge, owing to the absence of valves in the uterine veins, and the momentum of the blood downwards. They are also liable to prolapsus from the weight of the uterus, and the relaxation of the uterine ligaments, and the soft parts of the pelvis generally. With respect to the poor, no absolute limit can be placed, because of their urgent necessities; but, when it can be done, the patient should remain eight or ten days pretty much in the horizontal position, and, after that time, should rest during a portion of the day, until the end of the month.

After parturition, it is natural for the Bowels to be constipated. This, in part, arises from the exhaustion induced by labour in all the organs under the influence of the spinal cord, and, in part, from the small quantity of food usually taken within the first two or three days of the puerperal period. Left to themselves, the bowels would probably pass a week or ten days in a state of inactivity. It is usual and proper to give a mild aperient dose on the third day after labour, and the medicine in most common use for this purpose is castor-oil; or a seidlitz powder, or a draught of sulphate and carbonate of magnesia, in mint-water, will generally suit when castor-oil cannot be taken. The idiosyncrasy of the patient should be consulted upon this point, and any aperient avoided which is likely to cause gastro-intestinal irritation.

On paying our first visit to a lying-in patient, which should always, if possible, be within twelve hours of her delivery, one of our questions should be with respect to the state of the Bladder. In long and painful labours, especially in primapara, it not unfrequently occurs that the bladder is quite paralysed to the influence of volition, and the patient finds herself unable to pass urine. This paralysis appears to depend on the pressure exerted upon the neck of the bladder by th fœtal head, and to affect the sphincter vesicæ chiefly. Thi feeble action of the bladder is also increased, and in som cases caused altogether by the opiate administered after d livery. The effects of pressure are probably aided by tl influence of the shock of labour upon the lower part of the spinal marrow. The difficulty generally disappears spontaneously after a few days, the bladder recovering its tone and irritability. Sometimes a little urine is passed, but the bladder is unable to empty itself thoroughly. Besides asking the question, it is proper, if there should be any doubt upon the subject, to place the hand upon the hypogastrium, when, if the bladder be distended, its elongated oval outline is readily felt above the pubis. The remedy is of course the use of the catheter for a few days, if necessary. It is of great importance to diagnose this affection, as a distended bladder may be mistaken for other diseases, and the patient put through a course of inapplicable treatment; or the organ may be ruptured, and lead to a fatal result. Convulsions have also been excited by the irritation of vesical distension. The quantity of fœtid ammoniacal urine drawn off in some of these cases is quite astonishing.

It is necessary to say a few words respecting the management of the Infant during the puerperal period.

After delivery, it is expected that the accoucheur should make such an examination of the child as will enable him to say that the infant is perfect and well formed. The state of the genital organs, the hands and feet, and the mouth and oral cavity, should be observed. At our first visit, we should inquire whether the child's bowels have been relieved or not, and whether it has passed urine. The bowels are generally purged by the irritation of the meconium and the effects of cold upon the surface. If the bowels have not been moved, or the evacuations are insufficient, a teaspoonful of castor oil should be given. In cases of retention of urine, the bladder can generally be made to act by sprinkling a little cold water upon the hypogastrium, by applying a hot sponge to the genitals, or by the use of a warm bath. Sometimes the phymosis natural to the male infant is so great as to interfere with the flow of urine, or micturition is always attended by pain. In these cases, relief is obtained by dilating the aperture of the prepuce by a probe. The child is generally kept in the same room as its mother, and the subdued light proper to the lying-in woman is well suited to the delicate eyes of the child.

The management of the Funis is usually very simple. It is wrapped in a piece of singed linen by the nurse, and the projecting portion dies and falls from the umbilicus within a

Asses' milk, to which a little cream has been added, or cows' milk, diluted at first with an equal quantity of water and sweetened with sugar, the quantity of water being diminished as the child becomes older, form the best infantile nourishment under these circumstances. The milk should always be fresh, and some experienced nurses greatly prefer boiled milk for children.

Many of the matters treated of in the present and the preceding Chapter may be thought to pertain to the nature of "common things;" but attention is not the less necessary to them, if we would conduct patients safely through parturition and the puerperal state in natural cases. It should always be borne in mind, that at any stage of the processes through which the patient passes between the commencement of labour and puerperal convalescence, the most simple case may be converted into one of difficulty and danger.

CHAPTER XXVI.

FACE PRESENTATIONS.

In the preceding chapters the mechanism and management of cases in which the Head presents in its different positions have been treated of. We have now to pass from the consideration of cranial presentations to those of the Face. The transition from vertex to face presentations is easy and natural, because of the identity of the parts concerned. It will be found convenient to direct attention to the following considerations in connexion with presentations of the face—namely, the mechanism, the diagnosis, and the management.

There is a very close analogy between the mechanism of face and vertex presentations. Let the fronto-mental diameter of the fœtal head be substituted for the occipito-frontal at the brim of the pelvis, and the similarity as well as the difference will be readily appreciated. It will be remembered that three kinds of obliquity were spoken of in the passage of the head through the pelvis in vertex cases:—1. An obliquity consisting of the position of the long axis of the fœtal head in one of the oblique diameters of the brim. 2. An obliquity, consisting of a dip of the posterior extremity of this axis in the cavity of the pelvis. 3. An obliquity, consisting of a dip what obscure; but we are in possession of certain physiological facts and principles which will account, to a certain extent, for a portion of these, as well as of other forms of mal-presentation. Before, however, going on to state these, it is interesting to remark, that *flexion* is the normal condition of the fœtus—every limb, every finger, the trunk, and, in fact, every moveable member is flexed, and the *extension* of the head, in face cases, must, therefore, clearly be the result either of unusual mechanical or vital conditions, intrinsic or extrinsic to the fœtus. The application of the foregoing and following considerations extends, it should be said, not merely to face presentations, but to mal-positions in general. Dr. Fleetwood Churchill and Dr. Simpson arrange the causes of mal-presentations pretty nearly as follows:—

1. Face presentations and mal-positions generally, are the result occasionally of premature labour, in which the moulding influence of the shape and contractions of the immature uterus and the reflex and tonic contraction of the limbs of the fœtus, are not effective.

2. They are the result of death of the fœtus *in utero;* or, in other words, of loss of muscular tone and the adaptive reflex movements, and an alteration of the specific gravity of the fœtal head.

3. They are the consequences of the application of unusual excito-motor stimuli to the fœtus and uterus.

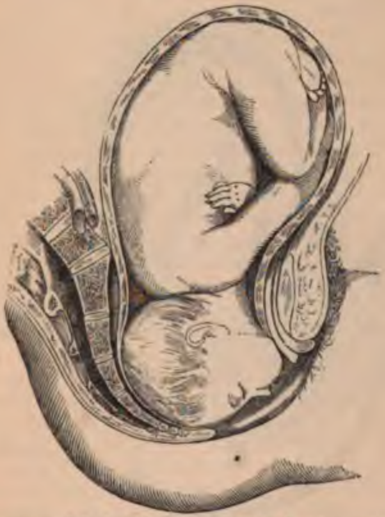
4. They are the result of causes mechanically displacing the whole fœtus, or the presenting part, during pregnancy, or at the commencement of labour, such as a large quantity of liquor amnii, or premature and sudden rupture of the membranes.

There are four presentations of the face, as of the vertex, and they are similarly numbered. In the first, the forehead is towards the left acetabulum; in the second, towards the right acetabulum; in the third, towards the right sacro-iliac synchondrosis; and in the fourth, towards the left sacro-iliac synchondrosis. These positions are the exact analogues of the four vertex presentations respectively, and may be looked upon as vertex cases in which the head has become accidentally extended. In practice, it will be found that the third and fourth face presentations are so extremely rare as hardly to be worth enumerating, and consequently our attention may be confined to the first and second only. The first is the most frequent, being to the second, according to Naegelé, as the opposing surface of the fœtus is thrown downwards and forwards under the arch of the pubis. As the chin advances and turns forwards, the arch of the cranium is directed backwards towards the hollow of the sacrum, and thus the head is completely lodged in the cavity of the pelvis. The right cheek and angle of the mouth are now the presenting parts, and the chin is just about to emerge from under the arch of the pubis. The next step is emergence of the chin, not exactly in the middle line, but still directed somewhat to the right, as in vertex presentations, where the antero-posterior diameter of the head is never exactly in relation with the antero-posterior diameter of the outlet of the pelvis. By the liberation of the chin, room is gained; and now a process of flexion takes place analogous to the extension of vertex presentations: the chin becomes temporarily almost fixed, and the head rotates upon its transverse axis, so as to bring the vault of the cranium out with a sweep over the perinæum, the occiput being the last part expelled. During the flexion described, there is an advance of the head *en masse*, but it is not so conspicuous as the flexion. If the face remains long in apposition with the os externum, a secondary tumour forms on the cheek; but, instead of being on the upper, it is on the lower half of the face, and involves more of the opposite side of the face than the primary tumour does. This is evidently in consequence of the depression of the chin, and the change from an oblique to an almost antero-posterior position in the long diameter of the face. The head having been expelled, the rest of the body behaves as in first vertex presentations. The right shoulder being lowest in the pelvis, is propelled against the anterior surface of the spine of the right ischium, and rotated from right to left, so as to place the shoulders nearly in the antero-posterior diameter of the outlet of the pelvis. The right shoulder is thus born first, and the left sweeps over the perinæum. The hips are born in the same manner. The following engravings represent the presentation of the face at the brim of the pelvis, at the outlet, and passing through the external parts. (Figs. 115, 116, 117.)

In the Second Facial Position, the details of the mechanism are exactly similar, only that the forehead is directed towards the right acetabulum, and the chin towards the left sacro-iliac synchondrosis, and all the rotations of the first position are exactly reversed. In fact, by using the word "right" for "left," and "left" for "right," the description of the me-position, it is in the same position as the vertex in the second cranial position; while in the second facial position, the chin emerges in the same path as the vertex in the first cranial position.

Certain varieties of face presentations have been described, in one of which the chin has been spoken of as sweeping over the perinæum. Smellie and Hamilton both include such cases in their systematic account of face labour; but with a normal pelvis and fœtal head of the ordinary size, such a mode of termination is utterly impossible without the aid of instruments. There is an intermediate presentation in which the head is neither completely flexed, as in vertex cases, nor completely extended, as in face presentations; this has been already alluded to as constituting brow presentation. On examining these cases at the commencement of labour, the frontal protuberance of the right or left side will be found to be as nearly as possible the

FIG. 116.



Emergence of the head from the pelvis in face presentation.

being forced down upon the pubis, and the chin hooked against the upper border of the great sacro-sciatic ligaments. These cases require the aid of the forceps, and are difficult to manage, on account of the fact that these instruments can only be applied in this position to the face, over which they do not slip very easily.

The diagnosis of face presentations may be considered to rest upon the absence of certain signs peculiar to other presentations, and upon the recognition of parts actually belonging to the face. The face may be distinguished through the membranes as a very uneven surface, totally dissimilar to the hard, smooth, globular mass of the vertex. If the head is very high, and the membranes tense and tough, it is not so easy to recognise the parts. It is still more difficult to determine the position through the walls of the cervix uteri. In a later stage of labour, continued pressure may so modify the contour of the face, and induce such swelling of the features, as to simulate very much the general aspect of a breech presentation. In this case, the malar bones, with their soft coverings, may be mistaken for the ischia and buttocks, the mouth may be so swollen as to be easily confounded with the anus, or the eyes may be confounded with the vulva of a female child. When no peculiarly untoward circumstances are present to obscure the real nature of the presentation, it is tolerably easy to recognise the frontal suture narrowing towards the root of the nose, the ridge of the nose, the orbits on each side, with their bony circumferences, and, beyond the nose, the large cavity of the mouth and the firm edges of the alveolar processes. If any doubt exists as to whether the face or breech presents, the difficulty may be cleared up in certain cases by an appeal to the surface of the abdomen: thus, in thin women, the parietes of whose abdomens are lax, and in whose uteri there may happen to be but a small quantity of liquor amnii, the head may occasionally be recognised externally as a spheroidal mass at the fundus of the womb, and this, of course, negatives the possibility of a face presentation. On the other hand, the character of the meconium may become diagnostic; for although it may be met with both in pelvic and cephalic presentations, yet in the latter, it is in a diluted state, and is very different from the tenacious meconium of a breech case, which has not been mixed with the amniotic waters.

We now arrive at the management of face presentations.

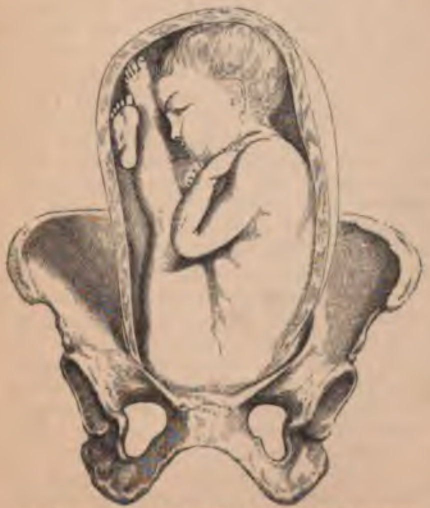
former times a great variety of contrivances were in favour ongst obstetricians for facilitating delivery in face cases. e foundation of this love of interference was evidently the rong conviction, which anciently prevailed, of the preternaural nature of the presentation, and this scientific prejudice ound its practical development in procedures essentially meddlesome and bad. The first of these unphilosophical procedures was that of turning; it was, of course, only recommended when the head was high in the pelvis and the liquor amnii as yet undischarged. Almost within the present generation, turning has been recommended in face cases, by high authorities. It is now a well ascertained fact, that, putting out of the question the danger accruing to the mother from the operation of turning, the chances of death to the child are more than doubled. The greater control which the accoucheur has over the progress of labour is certainly an attractive feature in the mode of practice; but as very rapid delivery is by no means the great desideratum in obstetrics, it is right to relinquish the control for the sake of additional safety. It should never be forgotten, too, that in all cases of version, however skilfully performed, there are certain risks to the mother, arising out of mechanical violence, inflicted either by the operator, or by the uterus upon itself; while shock and irritation, perhaps running on into inflammation, are but too frequently the results of manual interferences, in which no mechanical violence whatever has been applied to the parts. Turning can only be admissible when there is such a complication as necessitates our putting the safety of the child out of the question, and balancing the operation of version against some more violent natural or artificial termination to the labour. Dr. J. Clarke adopted another plan, which was to wait until the head had descended into the cavity of the pelvis, and then to exert steady pressure, in a direction upwards and backwards, upon the presenting cheek during each pain; by this means he averred that he succeeded in lodging the face in the hollow of the sacrum, and that the labour then terminated as in vertex cases. Whatever may have been the results of this practice in the hands of Dr. Clarke, it is obviously attended with considerable risk; in the first place, success is very doubtful, and it is far more probable that a brow presentation will be brought about than that a rectification will be produced; and in the next place, the procedure is a violent one as regards the child. A moment's consideration of the mechanical relations of the parts concerned will show that, as soon as any elevation of the chin is obtained, the arch of the cranium will be brought down upon the pubis; and should the uterus act with any vigour, he will be a dexterous operator who terminates the case without the forceps or some graver procedure still. A more pernicious mode of practice than either of the above was first recommended by Baudelocque, and received the sanction of Lachapelle, as well as some British obstetricians. The operation was founded upon a misconception of the mechanism of labour in face cases of the following nature. It was supposed that whenever the chin was towards the sacro-iliac synchondrosis of either side, the head must necessarily pass out of the pubis with the chin directed posteriorly. Whenever such cases had been actually observed, they had certainly been seen to be attended with great risk to the fœtus and suffering to the mother; but the grand error was that not only are mento-posterior presentations, as a general rule, changed into mento-anterior ones, but that, instead of mento-posterior positions being exceptional and peculiar, they are the most frequent of face presentations. The fact that the chin was generally towards one or other sacro-iliac synchondrosis was not known, and the rotation of the chin forwards in nearly all cases, was equally undiscovered. It was thought that an original anterior position of the chin was the only favourable position in face cases, and, knowing what we now do as to the infrequency of this presentation, it can hardly be a matter of surprise to us that such frequent manual interference was resorted to, and that such an unfavourable prognostic was applied to face presentations in general. The operation in question was to be performed in the early stage of labour, before the membranes were ruptured. It was recommended to introduce the hand into the vagina, through the os uteri, and into the space between the brim of the pelvis and the forehead of the fœtus; the palmar surface of the fingers being kept towards the head of the child. The next step was to rupture the membranes and hook the fingers over the arch of the head, and, if possible, drag down the occiput,—indeed, this was the object of the procedure,—and thus convert the face presentation into an ordinary vertex one. The objections to this method are numerous. Since Naegelé wrote his celebrated treatise on the mechanism of labour it has been generally known that not only is the

In actual practice, it will be found that the treatment of face cases is extremely simple. We may assist the chin in making its rotation forwards and downwards, by introducing the finger into the child's mouth, making traction upon the lower jaw, and bringing it under the arch of the pubis. Meigs lays it down as the great rule of practice in face cases, that the chin should be brought towards the pubis as the face emerges from the pelvis. This is an analogous procedure to that of bringing the occiput down in vertex cases, either directly, by the fingers applied to the back of the head, or indirectly, by pressure exerted upon the forehead. The principle is the same in both cases—viz., to favour the birth of that part which tends to be born first. Should the head fail to rotate in the pelvis, the forceps will generally be necessary, or the head must be dislodged, and the child delivered by turning. Where delay arises, not from faulty position, but from disproportion in bulk between the head of the fœtus and the pelvis of the mother, or from inadequate uterine contraction, the same rules of treatment apply as in cases of impactment or inertia uteri, where the vertex presents, with this modification, that as the parts engaged in the pelvis are more solid, less advantage will be gained by delay in so far as moulding of the head is concerned, and more danger will accrue to the mother from pressure upon the rectum and bladder. The fœtus itself is more endangered, too, by long engagement in the pelvis, in face than in vertex positions, the vessels of the neck being often injuriously pressed upon. During the progress of a face case, care should be taken to keep the pelvic viscera empty, and to preserve the membranes entire as long as possible. In making examinations, the delicate structure of the organs within reach should be remembered, as cases not unfrequently happen in which the eyes have been seriously injured by careless manipulations. Examinations should not be more frequent than necessary to determine the exact presentation at first, and the subsequent rate of progress. The perinæum should be carefully guarded, but not pressed upon. After birth, the features of the child will generally be found hideously distorted, the mouth dragged to one side, and one or both eyes occluded. Fomentation with warm water, decoction of poppy-heads or marsh-mallow, will be all that is necessary, as the parts will gradually return to their normal condition.

case, however, is the back of the fœtus situated quite anteriorly or posteriorly, but rather obliquely, so that one hip is more anterior than another. The dorso-anterior position is, according to the same authority, more frequent than the reverse presentation, in the proportion of three to one. Let us now examine the mechanism of pelvic labours, first premising that they ensue according to fixed laws, as cranial labours do, with only this difference, that deviations from the usual course are perhaps rather more frequent, and attended with less risk than when the head presents.

In dorso-anterior pelvic presentations, the relation of the fœtus to the maternal pelvis is, generally speaking, as follows :—The transverse diameter of the child's hips occupies the left oblique diameter of the pelvis, its sacrum is directed towards the left acetabulum, its left trochanter towards the right acetabulum, and its right trochanter towards the left sacro-iliac synchondrosis. (Fig. 118.) Upon examining as

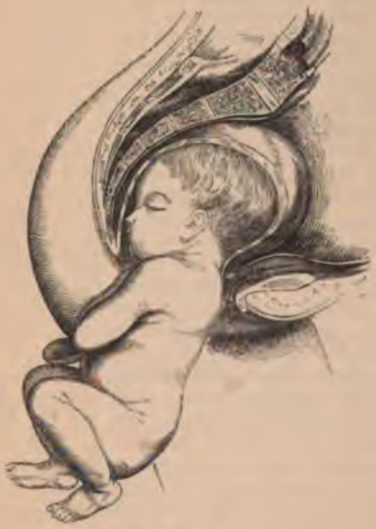
FIG. 118.



Pelvic presentation in the first dorso-anterior position.

same mechanical necessities in its exit, in pelvic labours, as when it presents at first. Supposing the breech to have become entirely engaged in the cavity of the pelvis, the left hip will be found just within the vulva, and the right hip beginning to press down on the floor of the pelvis posteriorly, and somewhat to the left side. The left hip then becomes nearly fixed under the pubic arch, and a movement of flexion takes place analogous to the flexion of face and the extension of vertex labours; the right hip sweeps over the perinæum, the pelvis of the fœtus rotating, as it were, upon its antero-posterior diameter. As soon as the right hip has escaped from the tight embrace of the perinæum, a movement onwards *en masse* takes place, the feet usually slip out, and presently the knees become disengaged; and the inferior half of the child's body is thus born. The abdomen of the fœtus is now turned towards the inner side of the right thigh, or, supposing the woman to be in the ordinary obstetric position, upwards. The rest of the body follows in the same manner, the shoulders entering the left and oblique diameter of the inlet. The manner in which the arms are born depends upon whether they remain folded upon the chest of the fœtus, or are displaced during the progress of labour. In the first instance they slip out as the thorax is expelled; in the latter, they are extended upwards on each side of the head, or one may even become locked behind the head, and between it and the pubis; and serious inconvenience may arise from such an accident. If the arms remain extended by the side of the head as the latter passes through the pelvis, the difficulty of the case is of course enhanced. The left shoulder of the fœtus, like the first hip, becomes first engaged in the outlet of the pelvis, and the right shoulder distends and sweeps over the perinæum. (Fig. 119.) During the progress of labour, the fœtal head in most cases remains flexed upon the chest. As the shoulders are about to emerge, the head enters the opposite oblique diameter of the pelvis to that which the hips and shoulders have occupied; thus the forehead is towards the right sacro-iliac synchondrosis, and the occiput is directed towards the left acetabulum. The occipito-frontal diameter of the fœtal head is not, however, exactly that which comes into relation with the right oblique diameter of the pelvis, for the chin is depressed and the occiput is the highest point of the fœtus; it is the sub-occipito-frontal diameter which presents, and thus sufficient room is gained to allow the head to become the pelvis; the right buttock presents, if it is a breech case, and occupies the greater and anterior segment of the os uteri; and the left buttock sweeps the perinæum. The right side of the fœtus is directed steadily somewhat to the left acetabulum, and its abdomen turns downwards, or towards the left thigh of the mother. The head enters the left oblique diameter of the pelvic inlet, the forehead being towards the left sacro-iliac synchondrosis; the face turns into the hollow of the sacrum, as in the first instance, and the whole progress of the case is in fact the converse of what happens in the first position; just as the second is the converse of the first vertex or face presentation.

Fig. 120.



Descent of the head.

Abdomino-anterior positions of the fœtus, with the breech or lower extremities presenting, are of two kinds. In the alluded to is where the head, instead of being flexed upon the chest, is extended, the occiput being pressed down upon the nape of the neck. In such cases the vertex rotates backwards into the hollow of the sacrum, the under surface of the lower jaw is brought into relation with the symphysis pubis, and the head emerges in such a manner that, first, the occipital protuberance sweeps over the perinæum, then the arch of the cranium, and then the forehead and face. The foregoing account of the mechanism of pelvic labours applies in every essential particular to each variety. There are, however, one or two subsidiary differences depending upon whether the nates, knees, or feet present. When the breech presents, the birth of the body is slower, but the head follows more readily; when the knees descend, they sometimes create delay by becoming fixed against some point of the bony pelvis, more especially against the lower part of the sacrum; and when the feet present, the birth of the lower half of the body is comparatively rapid, while delay ensues in the passage of the shoulders and head. In labours where the breech or knees present, reliance may be placed upon the position of the presenting part, as an index of the actual position of the fœtus; but when the feet present, it must be borne in mind that they are very mobile, and only assume a determinate position when the nates enter the brim of the pelvis. In some cases of pelvic presentation, it has been remarked by Drs. Hardy and M'Clintock, that the anterior-superior spinous process of the ilium presents, in the first instance, and may cause some confusion.

The diagnosis of pelvic presentations rests upon signs some of which are common to each variety, while there are particular signs by which each special presentation may be determined. The first thing to which the attention is directed in pelvic presentations is the absence of those familiar conditions which obtain when the head of the fœtus is at the brim of the pelvis: and, failing to recognise these, the accoucheur naturally looks for data upon which to found a positive diagnosis in lieu of his negative one. Popular opinion, amongst females at least, attaches much importance to the external configuration of the abdomen, and hence the slightest deviation from the usual form or size excites in women strong apprehensions of mal-position of the child. As long, however, as the long axis of the ovoid mass formed by the fœtus corresponds to the long axis of the uterine cavity, it will make but little differ-abdominal parieties. When the pelvic extremity of the fœtus is its depending portion, these sensations are said to be in a great measure absent, or if perceived, to be referred to a much lower situation. Little reliance can be placed upon auscultation alone in determining pelvic presentations. The fœtal heart beats so nearly midway between the one extremity of its body and the other, that but little alteration in the distance from the pubis, at which it is best heard, is effected, whether the cranial or pelvic extremity of the fœtus depends. When it is remembered that considerable variation in this respect obtains in cranial presentations, it must be conceded that, however useful auscultation may be in other circumstances, we can expect but little assistance from it here. In the first dorsal anterior position, the fœtal heart may be heard loudest a little to the right of the mesial line, and somewhat below the level of the umbilicus; in other positions the sounds of the heart are somewhat obscure, and, in short, auscultation is not to be implicitly relied upon. The manner in which the liquor amnii is discharged is peculiar, though not so characteristic in breech as in knee and footling cases. When the head presents, the membranes rupture, and a sudden gush of water follows, which as suddenly stops; this is because the head is forced down upon the os uteri, and acts as a ball-valve. In pelvic presentations, the gush is not so sudden, and the waters of the amnion continue to flow until the uterus is emptied of all its contained fluid. As might be naturally expected, the character of the pains alters as soon as the membranes have burst, and from this time until the whole body is expelled, and nothing remains but the head in the cavity of the pelvis, the uterine contractions are more clonic, continuous, and closer together than in cranial labours; the absence of fluid from the uterus multiplies the points of contact between the fœtus and uterus, and increased excitation results in increased motor action. But the chief and conclusive evidence of pelvic presentation is the recognition of the individual parts which offer themselves to the touch per vaginam. In breech cases, very little can be accurately distinguished before the membranes are ruptured, beyond the moveable coccyx and the rugosities of the sacrum; these can generally be felt behind one or other acetabulum. As soon as the liquor amnii has escaped, however, the finger of the accoucheur comes into direct contact with the parts of the fœtus. The os uteri will be found occupied by two smooth elastic tumours, divided by well not to be positive until the hips enter the brim of the pelvis; but if both descend, and cross each other, the anterior surface of the body must be in the direction of the toes. When one foot comes down, it should always be identified as right or left.

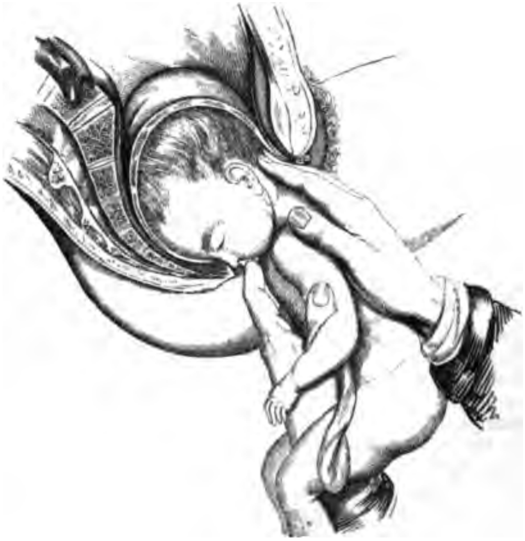
Having fully satisfied ourselves of the exact position of the fœtus, we have little to do until towards the conclusion of labour. The accoucheur should be an observant spectator of the operations of Nature, thoroughly cognizant of what those operations are, and capable of appreciating at once the slightest departure from their normal course. The first care should be, not to rupture the membranes. In knee and footling cases this caution is even more necessary than when the breech presents. The bag of membranes is required to the last moment, as a dilating agent; no part of the fœtus in pelvic presentations will dilate the passages so equably or so efficiently as the waters of the amnion. A solid body, not possessed of the globular form of the cranium, will exercise pressure in certain directions, according to its specific form; water presses equally in every direction, and water therefore we should endeavour to retain within the membranes as long as possible. This is a cardinal point in the management of pelvic labours. Ancient practice in this particular was very different from modern, and opposed so obviously even to *à priori* considerations, that it is difficult to conceive the necessity of the hard teachings of experience to show its defects. Dr. William Hunter at one time used to convert all breech cases into footling ones; subsequently he was less disposed to interfere with Nature, and he then found his proportion of deaths in pelvic labours very much diminished. Smellie's advice sounds somewhat singular in modern ears; he says, "If the knees or the feet of the child present to the os internum, which is not yet sufficiently dilated to let them and the body come down, let the operator introduce his hand into the vagina, push up and stretch the os uteri, and bring along the feet." Supposing the membranes to be ruptured, the best rule is to let Nature take its own course until the body is born as far as the umbilicus; only guarding the perinæum and relieving it of tension by favouring the flexion of the trunk. The less we interfere, the less rapid will the descent of the fœtus be; and it is very important to secure, if possible, a slow passage of the pelvis and trunk, and consequent complete dilatation of the passages. If the knees

[illegible] accidentally get [illegible] in the cavity of the pe
they must of course be liberated; but this is an accident,
not the usual course of events. The *laissez-faire* system
not apply, of course, to cases of inertia uteri; if the breec
hips of the child do not advance, from defect of uterine
traction, either the uterus must be excited, or traction
be made upon the fœtus. Various methods of applying t
tile force have been adopted; the finger may be hooked in
groin, or a silk handkerchief passed round the flexure of
thigh, or the blunt hook may be used. A dexterous obst
cian will generally succeed with the unaided hand, and, ind
the blunt hook is an unnecessarily formidable instrument
such purposes; it bruises soft parts, and is very likely to f
ture the thighs of the fœtus. When the umbilicus clears
perinæum, the dangerous part of the labour begins; an ab
mal element—viz., compression of the funis—is introdu
into a process otherwise normal; and now our art must
exercised and imposed between the fœtus and impen
death. The first interference necessary is to draw dow
loop of the cord; this is done with a view to obviating
compression which may arise from straightening out of
spirally-coiled umbilical vessels, in the further descent of
trunk. An effort should then be made to draw the cord i
one of the recesses on either side of the promontory of
sacrum, as this position is one in which there is less risk
pressure than in any other. The strength of the funic
pulsations should now be narrowly watched, as it bea
direct ratio to the chances of live birth; as long as the c
beats steadily, no interference is necessary, and ind
should be avoided. It is very tempting to see the legs da
ling out ready to be grasped, and to know that the fœtus
be seized and dragged forth without much delay, and the
standers will generally applaud the zeal of the accouch
who endeavours to hasten the birth under these circ
stances; but it sometimes happens that premature effort
traction dislodge the arms from their position on the chi
breast, and throw them up on each side of, or even behind,
head; and it again results, at other times, that the head
comes extended, that the arch of the cranium is rotated
the hollow of the sacrum, and that the child is lost from
sequent delay in the passage of the head. Until there
valid reason, then, for interference, arising out of the
dition of the fœtus or the mother, nothing should be done.

the chest is being forced out, it is necessary to be observant of the position of the arms; if they are in their natural position they will slip out of themselves, but if they are extended on each side of the head it will be proper to bring them down. It is best to bring down the arm nearest the perinæum first, as there is more room for manipulation in that direction. One or two fingers should be hooked round the humerus, near the elbow-joint, and the arm should then be drawn gently over the face and chest, not dragged directly downwards. Inattention to this precaution may procure the disagreeable accident of fracture of the humerus. This is not a very uncommon accident in midwife's midwifery, and, indeed, it was of old a rule of practice amongst them to break the arms, as an expeditious and simple method of meeting this difficulty of pelvic labours. The other arm should be dealt with in the same manner. As the shoulders are born, the perinæum again requires care, and as soon as they are liberated, the face will generally rotate into the hollow of the sacrum. The largest and most unyielding part of the fœtus has now to be expelled, at a great mechanical disadvantage. The uterus is so far empty as to have lost much of its power over what remains behind, and the birth of the head is, in fact, principally effected by the diaphragm, abdominal muscles, and muscular structures within the pelvis. Danger accrues to the fœtus more than ever now, from pressure on the cord; and the placenta is so jammed down upon the head of the child as in a great measure to destroy its function as a respiratory organ. This is the stage of labour in which life is generally lost, in which the natural powers avail least, and in which the intervention of art is therefore most needed. It is necessary still, however, to be guided by the actual condition of the child; if the cord beats steadily, it is better to wait for a time than to interfere hurriedly. The signs of danger to the child are failing of the umbilical pulse, and the occurrence of occasional gasping respiratory movements. Whenever it happens that once or twice in the course of a minute inspiratory movements of the muscles of the chest and abdomen are observed, the head of the child remaining as yet in the pelvis, we may be sure that the child is dying of asphyxia. These movements are caused, as already mentioned, by the carbonated blood of the fœtus, in cases of pressure upon the placenta or funis. No other sign of danger to the fœtus is so trustworthy as the occurrence of these jerking spasmodic attempts at respiration.

The necessity of interference being clear, there is no great difficulty in rendering it. A finger or two of the left hand should be introduced into the child's mouth, or laid one on each superior maxilla, and the face should be drawn steadily down towards the fourchette of the perinæum; at the same time, the occiput should be pushed up by a finger or two of the right hand, introduced behind the pubis. (Fig. 121). This manœuvre will bring the shortest possible diameter of the fœtal head into relation with the antero-posterior diameter of the outlet of the pelvis. The head will emerge now, with the aid of gentle traction, towards the knees of the mother, and the birth is complete. Whether the position of the fœtus is a dorso-anterior one or an abdomino-anterior, the management

FIG. 121.



Manual extraction of the head.

varies hardly at all. The occiput rotates forwards from its posterior position just as in third and fourth vertex cases; and Nature will generally adapt the head to the pelvis much better than the accoucheur. No force should be used in the extraction of the head. Above all, traction should never be exerted upon the shoulders, as very slight extension of the neck is sufficient to destroy the child. The stretching of the upper part of the spinal marrow is very dangerous to the life of the infant. Where the head in breech cases is impacted at the outlet of the pelvis, it is sometimes possible to pass up two fingers to the mouth of the child, and to admit a sufficient quantity of air to allow of respiration before the delivery of the head. This was first recommended by Pugh, and Dr. Bigelow, acting upon the same principle, recommends the use of a flat flexible tube for the same purpose. The forceps should always be had in readiness in breech and footling cases. When the head cannot be delivered, or respiration set up by the processes described, and when the danger to the child is imminent, the Forceps should invariably be used. A delay of a minute or even a few moments may sacrifice the life of the fœtus. The forceps is still more likely to be required in footling than in breech cases. When the child is dead or premature, particularly in the former case, less precaution is of course necessary in extracting the head.

Delay and difficulty may occur at various stages in the progress of pelvic labours; thus, there may be ascites, or accumulation of urine in the fœtal bladder; or the child may be tympanitic; or there may be hydrothorax, or hydrocephalus. Any of these accidents may render evisceration necessary. Anchylosis of the coccyx with the sacrum, or a flat or too incurvated condition of the latter bone, may also prove a serious source of delay and danger to the fœtus. Sometimes the os uteri seizes the neck or head of the child, and retards delivery. It is proper, in cases where the breech or lower extremities present, to be prepared with the necessary means of restoring suspended animation. A supply of hot water for baths, and a gum-elastic catheter for inflating the lungs, should be at hand. If there is much cerebral congestion, it will be advisable to allow one or two drachms of blood to escape from the funis. Friction of the surface of the body, aspersion with cold water, and galvanism, may be had recourse to with benefit.

It is always interesting to note the influence of mal-presentations upon the life and subsequent condition of the mother and fœtus. As far as the mother is concerned, it can hardly be said that there is any appreciable difference in the risk of cephalic and pelvic labours. Non-expulsion of the head is the circumstance most likely to prove detrimental to the mother; and bruising of the parts within the pelvis from impactment, or the supervention of inertia uteri followed by flooding, are the forms of danger to which she is exposed. The danger which accrues to the child is, however, very considerable. In breech cases the deaths are as 1 to 3⅓, and in footling cases as 1 to 2½. The gross proportion of deaths in all presentations of the pelvic extremity of the fœtus is about 1 in 3. Death takes place from asphyxia, either produced by compression of the cord or of the placenta, or from early detachment of the placenta, or coma is produced by obstruction of the veins of the neck, and, lastly, the infant may perish from shock or exhaustion. Instrumental interference is based, of course, upon the same general principles which apply to other forms of parturition; but it is of especial importance in breech cases to note by the stethoscope the condition of the fœtal heart. Spontaneous pelvic presentations are less dangerous both to mother and child than the artificial pelvic presentation procured by the operation of version. According to Dr. Fleetwood Churchill's collection of nearly 200,000 cases, the breech presented in the proportion of about 1 in 59½; footling or knee presentations were about 1 in 105 cases.

CHAPTER XXVIII.

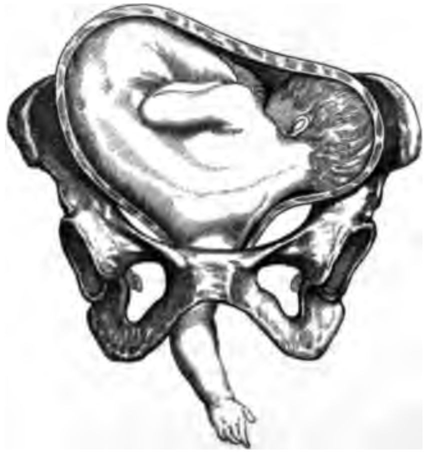
TRANSVERSE PRESENTATIONS.

In the preceding Chapters we have considered those
sentations in which the cephalic or pelvic extremities o
fœtal ovoid are found at the os uteri. We have now to
of those presentations in which the long diameter
fœtus is opposed to the short or transverse diameter
uterus. These cases are termed Transverse or Cross
and include the presentation of the shoulder or som
part of the superior extremity, and the presentation

›f the dorsal or abdominal surfaces of the child. The important, and at the same time the most frequent, are in which the shoulder, elbow, or hand presents, all of ı are spoken of as arm presentations. To these cases we ›hiefly direct our attention, as the cases in which some ›n of the trunk presents are treated according to the principles as arm cases.

arm presentations, two principal positions are recognised, ıding on the relations which exist between the abdomen lorsum of the fœtus, and the back and abdomen of the er. In the majority of transverse births, the back of the is towards the abdomen of the mother; in a small pro›n, the back of the fœtus is towards the maternal spine. › may be termed the Dorso-anterior, and Abdomino-ior positions. (Figs. 122 and 123.) They occur in the

FIG. 122.



Arm presentation in the dorso-anterior position.

›rtion of two of the former to one of the latter. Besides bdomino-anterior and abdomino-posterior positions, there ›ur subsidiary varieties in the position of the child in ›ases, depending on the situation of the fœtal head on sentation of any part of the body, the arm and head, both arms, the funis and arm, or an arm and foot, may descend together. Perhaps we scarcely ought to consider the descent of the arm and head, or of the hand and foot, as strictly transverse presentations, since it is a mixture of the transverse and the cephalic or pelvic, and may terminate in the case of the hand and head, in cephalic, or in that of the hand and foot, in pelvic delivery.

Apart from the physical examination of the patient there are no distinct symptoms of the occurrence of transverse presentation, which can be depended on, before the commencement of labour, though we know that in many of these cases the preternatural position is assumed some time before the date of labour. In some cases, the width of the uterus and abdomen is noticeable; but when this is the case, it is difficult to form, from the appearance alone, a diagnosis between the child lying in the transverse diameter of the uterus, and twin pregnancy. In many cases there is no deformity in the shape of the uterus. In some women, who are the subjects of cross-births, uterine cramps and spasms are complained of; but in others nothing of this kind occurs, and labour comes on more slowly, and, one may almost say, more insidiously than in other cases. Owing to the absence of the head from the os uteri, the dilatation goes on more slowly and painlessly than usual. This is a disadvantage, inasmuch as labour is frequently hardly suspected, and the accoucheur may not be sent for until considerable progress has been made. It often happens in transverse, still more than in pelvic presentations, that no part of the child can be felt in an examination in the early part of labour. In arm cases, it is generally the shoulder which is the primary presentation, the arm and hand coming down as the labour progresses. When the shoulder presents, the transverse position of the long diameter of the child frequently keeps it above the brim of the pelvis for a considerable time after the commencement of the dilatation of the os uteri. When the arm or hand is felt, much care should be taken to complete the examination, so as to ascertain whether the hand is descending with the head, or whether the shoulder engages the pelvic canal. The diagnosis of arm cases is frequently difficult, and we should not give a positive opinion until we can examine satisfactorily through the os uteri. We may sometimes suspect the nature of the case by examining through the anterior wall of the cervix, before the dilatation

of the os, but it is better under such circumstanc
give a positive opinion. The diagnosis between
and shoulder, the knee and elbow, and the hand a
been given in the preceding chapter, so that it is u
to repeat it here; the chief difficulty is in the
between the elbow and the knee, when both the le
arm are bent upon the thigh or arm. In cases of
best to bring the hand or foot gently down, whe
rence between the upper and lower extremities ca
made out. No harm is done by this manipulation
knee or elbow cases. When there is a suspicion
pelvic presentation, the patient should never be le
nature of the case is clear; but this is particular
when the arm is the presenting part. It is, as w
of the highest importance that arm presentations
recognised as early as possible. Perplexing case
ever occur, in which the head presents, in the firs
but is afterwards converted into a presentation of
a manner to be referred to hereafter. These are c
of deformity of the brim of the pelvis.

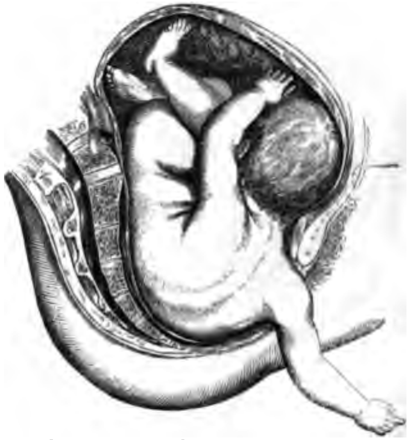
Up to the present day it has been thought
impossible to diagnose with anything like accuracy t
of the fœtus in utero in ordinary and extraordina
pregnancy. In women in whom the abdominal p
the walls of the uterus are very thin, the limbs a
parts of the child may with care be distinguishe
many cases the fœtal head may be felt distinctly in
or ninth month through the anterior portion of
uteri, on making a vaginal examination. Beyon
great attention had ever been paid to the subject.
and former pupil, Mr. Gustavus Murray, who ha
cently studying in Vienna, informs me that Dr.
distinguished professor of midwifery in that cit
himself very successfully to the demonstration of
position in the latter months of pregnancy.
used by Prof. Braun are percussion, auscultation
pation externally, aided by digital examinations
By percussion, the boundaries of the gravid
position of the bulky portions of the fœtus, as th
trunk, and the quantity of liquor amnii, partic
this is in excess, can be ascertained. By auscul
situation of the fœtal heart, and the site of th
attachment, can be made out. By digital examina

contents of the lower part of the uterus, through the os and anterior wall of the expanded cervix, we get, sometimes positive, and always approximative, information in cases of head, nates, footling and arm, or placental presentations. As an instance of Prof. Braun's method, we may take a case in which the fœtus is waiting in the last month of pregnancy for delivery in the first vertex position. The fœtal head may be felt by the forefinger of the right hand in the vagina, through the os and anterior segment of the cervix, lying rather more on the left side of the pelvis than the right. If at the same time two or three fingers of the left hand are placed externally in the left inguinal region, and pressure made into the pelvic brim, the fœtal head will be felt by the two hands. The fœtal heart will be heard about midway between the anterior superior process of the left ilium and the umbilicus. Above the pelvic brim, on the left of the median line of the abdomen, the curved outline of the fœtal spine may be made out, with the nates at its summit, and the inferior extremities will be found coiled up and presenting towards the upper and right side of the fundus uteri. During the manipulations the upper and lower extremities may be felt moving, chiefly on the right side of the uterus. The mass of the liquor amnii is on the right side. Here the vibration of the fluid is most distinct on palpation, while the left half of the gravid uterus is most dull on percussion. In arm presentations there is the absence of the head in the pelvis on making a digital examination, and the cranium may be felt above the pelvic brim, either on the right or left side. With care it can sometimes be ascertained whether the anterior or posterior aspect of the fœtus is turned towards the abdomen of the mother, by the different sensations conveyed to the finger by the convex dorsal surface of the child and the concave ventral surface, upon which the anterior and posterior extremities are collected.

The causes of transverse presentations have been mentioned when treating of the natural attitude and position of the fœtus in utero, and the causes of pelvic presentations. The arm may present because of the death of the fœtus, also from obliquity of the gravid uterus, contraction of the pelvic brim, violent uterine contractions, twins, and excessive movements of the fœtus itself. These are the principal causes of transverse presentations. In the case of a dead fœtus, the loss of the adaptive movements of the child and the alteration in the of doubling upon itself, the arm and shoulder remained down, but became fixed against the arch of the pubis. The shoulder being fixed against the pubis, he observed the body and spine of the child to become bent, the nates to descend to the perinæum, and the lower half of the child to sweep down the sacrum and soft parts of the parturient canal, until the breech and inferior extremities were expelled. The other arm then came down, and the head was delivered as in breech cases. Dr. Douglas termed this manœuvre Spontaneous Expulsion, in contradistinction to the spontaneous evolution of Denman. Other observers corroborated the explanation offered by Douglas, and Denman was supposed to have been in error when he said that the arm receded before the descent of the body and breech. Later authors have, however, ascertained that both Denman and Douglas were right, and that in one class of cases the child is born in the manner described without recession of the arm, while in another the arm does not recede, but the shoulders become fixed to the pubic arch, forming a ginglimus or hinge in this direction, while the breech and body sweep down the sacrum and perinæum. These terminations form, however, the rare exceptions in breech cases, and though it is necessary to understand them, they must never be expected or waited for in the management of breech cases. The following engravings illustrate the process of spontaneous expulsion, which occurs more frequently than spontaneous evolution. (Figs. 124, 5 and 6.)

The operative treatment of arm and shoulder presentations is one of the most important within the range of obstetrics. The conduct of these cases calls for all the knowledge and judgment of the accoucheur, as his proceedings must vary considerably, according to the stage of labour and the particular complication of each individual case. It may be said of all cases of arm and shoulder presentation made out at the commencement of labour, that every precaution should be taken to preserve the liquor amnii from discharge. With this view, the necessary examinations should be made as gently as possible, taking care to exert no pressure upon the membranes when they are made tense by a pain. The patient should be kept in the horizontal position, and cautioned against making efforts at bearing down, either during the pains, or in evacuating the rectum or bladder. In cases where the shoulder presents alone, or where the arm hangs in the vagina and the shoulder engages the os uteri, the proper remedy, when the child is alive and at the full period, is the operation of turning. The earlier this operation is performed after

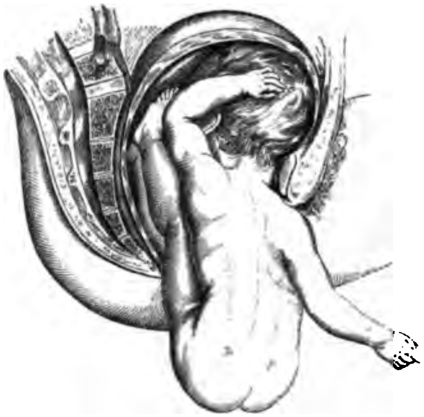
Fig. 124.



Commencement of spontaneous expulsion.

the detection of the presentation the better, unless in cases where the child is so fully engaged in the pelvis, or the uterine actions are so powerful, that means are necessary to relax the uterus, in order to make the operation practicable, and to avert as far as possible the danger of rupture of the uterus, or inflammation of the parturient canal. When the hand and head present together, no great efforts at putting up the arm or hand should be made, if the head has not fairly entered the pelvis, as by so doing the head may be pushed aside above the brim, and the case converted into one of purely arm and shoulder presentation. The arm and head form a less formidable complication than the conversion of such cases into the descent of the shoulder, as the hand and head may be delivered together with safety to mother and child. When the hand and head have entered the pelvis, and present at the os uteri, the hand may sometimes be passed up by the side of the head, in an interval between two pains, and if kept above the head until the pain comes on, it is swept above the brim, and the head descends alone. When the child is dead, but at the full term, in arm or shoulder cases, and so

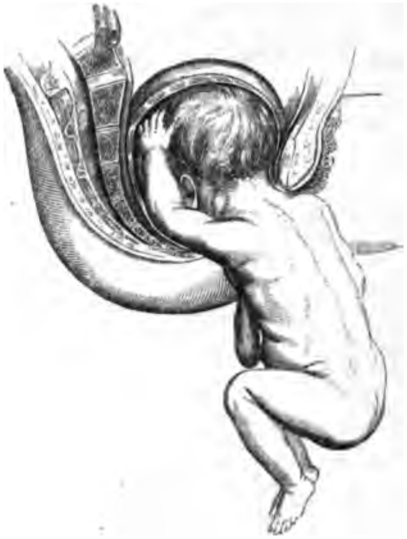
FIG. 125.



Further progress of spontaneous expulsion.

firmly wedged and low in the pelvis as to render turning difficult or impossible, the best practice is to eviscerate the chest and abdomen, and then to bring down the pelvis of the fœtus by the crochet. In the case of dead children at the full term, when the case is made out early in labour, turning is an easier operation, and less troublesome and dangerous to the mother, than protraction of the case, and evisceration and extraction. In rare cases, when the pelvis is very capacious, the action of the uterus powerful, and the fœtus small, or dead, or premature, the accoucheur may sometimes be called, when, the shoulder and arm being felt at the pubis, the ribs and body of the child occupying the lower part of the pelvis and pressing upon the perinæum, and some advance of this part of the child occurring at each pain, it is evident that the spontaneous expulsion of Douglas will terminate the delivery. Sometimes this spontaneous expulsion of the child takes place with great rapidity. I was once summoned to turn a child great distance from my own house, but before I arri

FIG. 126.



Termination of spontaneous expulsion.

woman had been delivered spontaneously. In other a cases, the arm and shoulder will ascend, and the nate down, under the influence of the pains, as in the spon version or evolution of Denman. As regards the gr most common procedure necessary in transverse prese —namely, turning by the feet—the circumstances of t ration are very much varied, according as the amnion tured or not; or the presenting part high or low in the and the length of time which has elapsed in thes between the commencement of labour and the perfo of the operation. In transverse cases, auscultation fœtal heart is imperative, as upon the life or death of the child the alternative of evisceration or turning may sometimes depend. In many arm and shoulder cases, the child has been dead for some time before the commencement of labour, and the cuticle is falling off or the limb is putrid. In others, a loop of funis is down with the arm, and its pulseless and flaccid state informs us of the death of the fœtus. The peculiarities incident to turning in transverse cases under every variety of circumstance will have to be considered when we come to the operative part of the present work. It may be mentioned, that when the arm presents in the case of the second child in twin cases, the same treatment is to be followed as though a single child had presented with the arm. The operation of turning is generally easy in such cases, from the smallness of the child and the dilatation of the passages. No doubt in arm cases the easiest and also the most difficult conditions for the operation of turning are met with. In a case where the liquor amnii remains undischarged, and the arm is found at the os uteri, the fœtus is moved almost as easily as a boat in water, the hand of the accoucheur can be introduced with comparative ease, and turning is a simple operation. But when the patient has been in labour, and the liquor amnii discharged, it may be for twenty-four, forty-eight, or more hours, the shoulder is jammed into the pelvis, and held as if in a vice. It is most difficult either to introduce the hand, or to move the child, and turning is now one of the most difficult, if not the most difficult, operation in obstetrics. The mortality to the mother and the child, but particularly the child, under these circumstances, is very great. Dr. Lee, in his "Clinical Midwifery," relates fifty-nine cases, and records the death of the mother in eleven, and the death of the child in thirty-two cases. These cases were amongst the most severe that could be met with in consultation practice; and such results should imprint upon accoucheurs the necessity of an early diagnosis, and prompt action in this form of dystocia. Dr. Fleetwood Churchill has collected the statistics of 112,140 cases, in which the superior extremities presented 484 times, or, taking the average, once in 231¾ cases. In 242 cases of presentation in which the results to the mother and child were recorded, 127 children were lost, or rather more than one in two, and twenty-six mothers died, or about one in nine. All statistics tend to show that in this complication, more than in any other, danger both to the mother and child increases with the prolonged duration of labour.

CHAPTER XXIX.

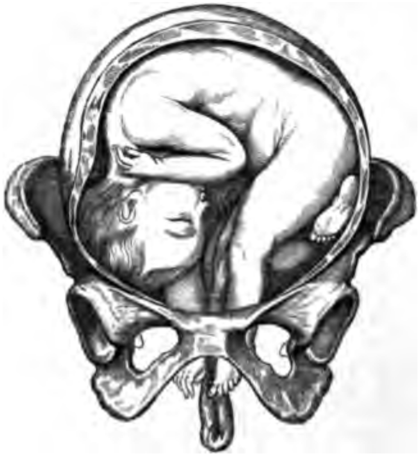
FUNIS PRESENTATIONS.

THE Funis may present alone at the beginning of labour, or it may descend with the head, arm, nates, and any other presentation of the fœtus. Its positive frequency is greatest in head cases, but relatively—that is, considering the small number of arm as compared with vertex cases—it is more frequent in arm and shoulder presentations than in other varieties of labour. This complication may occur at any time during labour. It may happen before the evacuation of the liquor amnii; when the head or presenting part is passing the os uteri; or when it is emerging from the perinæum.

The Causes of funis presentations are various. In arm cases, where the body of the child lies transversely, the anatomical position of the umbilicus and the funis favours the descent of the cord, and this descent is still further promoted by the fact, that in shoulder cases the circular os uteri does not at all points closely embrace the presenting part, on account of its irregularities. In its contractions, the uterus cannot sweep equably over the shoulder as it does in cranial presentations, during the pains, so as to carry up the funis when there is any tendency to prolapse. Presentations of the feet and breech, or of the hands and feet, are frequently complicated with the funis, and from the same causes. In the case of head presentations, length of the cord, small size of the head, the descent of the hand with the head, a large quantity of liquor amnii, and its sudden evacuation, or a pelvis above the average size, may occasion prolapsus of the cord. It happens occasionally in twin cases, particularly in the delivery of the second child. The position of the placenta is also influential as a cause of funis presentations. The cord is prone to descend when the placenta is partially attached to the os uteri, or when the placenta is fixed to the lateral walls of the uterus instead of to the fundus, or when the placenta being seated near the fundus, the cord is inserted into the edge instead of the centre of its diameter. Mr. Roberton, of Manchester, points out that, in cases of contraction of the brim of the pelvis, where, on the rupture of the membranes, children die, in cases where the cord presents. In arm presentations the mortality is rather more than 1 in 2. It will be remembered that in footling cases the mortality was 1 in 3½, and in breech cases, 1 in 2½. In turning, from all causes, the fœtal mortality is rather more than 1 in 3. Thus the presentation of the funis is more dangerous to the child than any other variety of labour.

The symptoms of funis presentations are sufficiently well marked to make their diagnosis easy. Sometimes a loop of cord, several inches in length, hangs from the vagina. It may be pulsating, or it may be cold and flaccid. But in one case the umbilical pulse, and in the other the twisted arrangement of the cord, or an ocular inspection, will remove all doubt. In cases where the cord comes down with the advancing part of the child, or presents with it at the os uteri, the only part of the full-grown fœtus which can be mistaken for it is the closed hand or the toes. The knuckles, when only part of the hand is felt, or the row of toes, may feel somewhat like the end of a

Fig. 123.



Presentation of the funis, with a hand and foot.

loop of cord. But the presence or absence of pulsation, and the examination of a few inches of the cord, or enough of the extremities to reach the wrist or the ankle, will make the matter clear. There is one complication of labour which it is necessary to mention, in which a mistake respecting the cord may lead to the most serious results. In cases of ruptured uterus, a coil of the small intestine may pass through the laceration, and present in the os uteri or the passage. This has in rare instances been mistaken for the cord of a dead child, and pulled down or even cut off by ignorant or incautious persons. A case of this kind occurred in Ireland, and another in London, incredible as it may appear, within the last ten or twelve years. In a case of this description happening to a midwife, in which a medical man might be called after the rupture of the uterus and prolapse of the intestine, some little caution would be necessary to avoid mischief. An inexperienced accoucheur might pull at the supposed cord, and do the gravest injury, particularly if the previous history of the case had been kept from him.

Of course, the cause of the great fœtal mortality in funis cases is the pressure exerted upon the cord, between the presenting parts of the child and the hard and soft parts of the mother. The child dies of asphyxia, the fœtal circulation being in severe cases entirely cut off from the respiratory functions of the placenta. We may compare the child under the circumstances of funis presentation to cases of turning, to cases in which the arm, breech, or feet present, or even to cases in which the placenta is separated, or the contractions of the uterus are so intense and continuous as to prevent the circulation of the blood in the maternal side of the placenta. The comparison between the presentation of the funis, and the descent of the nates or feet foremost, is very obvious. Wherever the order of labour is such that the funis, or any portion of it, precedes the descent of the more bulky portions of the fœtus, before the birth of the head, the case is in principle essentially one of funis presentation. Thus, in footling, breech, and turning cases, as soon as the umbilicus engages in the pelvis, pressure is exerted on the cord, and the cases resemble presentation of the funis. The mortality depends on the length of time to which the funis is subject to pressure, and the degree of the pressure during the exit of the fœtus. Thus it is greatest in funis cases proper, in which the cord comes before or with the presenting part, and is thus subjected to pressure during the whole of labour. Next to this, footling cases are the most fatal to the child, as here the pressure on the cord commences as the umbilicus descends through the soft parts, and these have been but little distended by the descent of the feet and breech in succession. In breech cases, the mortality is less than in footling cases, because the soft parts have been distended by the passage of the nates with the feet doubled up towards the abdomen. In cases of the descent of the cord with the head, in cranial or face presentations, the pressure exerted on the cord is greater than under any other circumstances, but it is of short duration, since as soon as air can reach the mouth of the fœtus, pressure on the cord becomes of little consequence. No very just comparison can be made between the mortality in cases of turning, and funis presentations, because the great mortality to the fœtus in turning, depends on other causes as well as upon the pressure upon the cord. Certain other circumstances besides the actual presentation exert an influence upon the mortality in funis cases. The younger the fœtus, for instance, the more safely pressure is borne, and the longer it may be continued without a fatal result. The risks of a fatal result to the child, when the funis presents in a first labour, are great, whatever the part presenting with the cord. They are much less in the case of patients who have had many and easy labours. The danger is also greater when the fœtus is male than female. The least dangerous cases of cord presentation are those in which it happens to the second child in twin cases, especially when, as frequently happens, the second child is smaller than the first. The danger is increased when the pains are very frequent and prolonged, but when the pains are moderate, and with a fair interval, the child recovers from the effects of the pressure of one pain before another comes on. Care should always be taken to inform the friends of the patient of the danger in which the child is placed by the descent of the funis.

The principle of Treatment in funis presentation is, the removal of the cord from pressure, or subjecting it to compression for as short a time as possible. These objects may be carried out by the Reposition of the Cord within the uterus; by placing it in such a situation in the pelvis as to escape Pressure as far as is practicable; or by artificial delivery, as by Turning, or the use of the Forceps. No one method can be advised for the treatment of such cases. The principle of to run in it readily. In using it a loop of the tape should be passed through the eye, and the end of the loop of funis should be included in the loop of the tape, when the ends of the tape should be drawn so as to bring the loop of funis towards the eye of the instrument, and to retain it there without exerting pressure enough on the cord to interfere with the placento-fœtal circulation. The whalebone should now be passed into the uterus by the side of the presenting part, in an interval between the pains, and after having been kept there during a pain, the tape may be brought away by drawing at one of the strings, and the slip of whalebone afterwards removed. If the noose be relaxed a little, so as to avoid strangulation of the cord, there can be no harm in leaving the instrument in the utero-vaginal canal, as it offers no impediment to the progress of labour. Michælis, of Kiel, recommended that a large-sized, male, gum-elastic, stiletted catheter should be used for the same purpose. He advised that the ligature should be passed *through* the loop of funis, when, being drawn loosely to the eye of the catheter, and the stilette being introduced only so as to avoid the possibility of doing injury, the instrument is to be passed above the head or presenting part, and left there, the stilette being withdrawn, until the completion of labour. But at the present time, Michælis has, I believe, abandoned his ingenious instrument for the use of the fingers. There is no reason why the cord should not, when it is sufficiently low to admit of manipulation, and when it returns after reposition, be pierced with a needle and thread or worsted, in such a way as to escape the vessels, and be tied to the end of a slip of whalebone, which might then be returned, and kept *in situ* until the completion of labour. But in ordinary cases, the accoucheur can do more with the hand and fingers than with the most ingenious instruments. In returning the cord with the hand, two or three fingers, of the right or left hand, as may be most convenient, should be introduced by the side of the head or presenting part, and with the tips of the fingers the prolapsed portion of the cord, being gathered together, should be pressed upwards during an interval of freedom from pain, and retained above the presenting part until the next pain comes on. When the uterine contraction reaches the ends of the fingers, they should be withdrawn, so as, if possible, to leave the funis within the grasp of the uterus. The contraction of the uterus will, if the operation be successful, sweep the cord the child. In a vertex case in the first position, with the head in the right oblique diameter, the funis should be kept as closely as possible to the left sacro-iliac synchondrosis; in the second position, with the head in the left oblique diameter, it should be applied to the right sacro-iliac synchondrosis, and in both cases the rectum should be emptied, but particularly the first, as the cord then lies between the side of the child's head and the rectum of the mother. In other presentations, when no other assistance can be rendered or seems necessary, the cord should be shifted as far as possible into that part of the pelvis which is least occupied by the child. It should rarely, if ever, be brought permanently towards the pubic arch, as in this position the effects of pressure are generally very great. In cases of large pelvis, in multiparous women, when the pains are moderately strong, and occurring at proper intervals, the passages being well relaxed, and labour completed in a short time, the careful arrangement of the position of the cord, without its reposition, will often be sufficient to secure the safety of the fœtus. In primiparous women, or where there is rigidity of the soft parts and a small pelvis, such measures are of little or no avail in arresting the long effects of pressure.

The propriety of Turning in cases of funis presentation, combined with any other part of the child than its pelvic extremity, is one of the vexed questions of obstetrics. Many eminent authorities have commended, and others condemned, this practice. The truth is, that the fitness of turning for any particular case requires great tact and judgment, and admits of no reduction to rule. Mauriceau performed it in a number of cases with great success in saving the child. So did Boivin and Lachapelle, and so have many contemporary accoucheurs. The strong point in the operation is, that it enables us to complete delivery in a shorter time than would otherwise be the case, and in this way the chances of safety to the child are increased. The weak points are, that the operation is not perfect, considered in relation to the object we have in view. It does not deliver the child from danger, but substitutes the risk of pressure from the shoulders and head upon the cord after the passages have been distended by the breech, for the primary pressure of the cord by the head without any previous distension of the parturient canal. Of course, in arm cases in which the funis presents, version is performed, but with reference rather to the arm than the funis complication. It would be very interesting to have a statistical comparison between the results to the child in those cases in which the funis presents in combination with the pelvic extremity and those in which it presents with the cephalic end of the fœtus. But I believe no such statistic exists, and, in its absence, we must consider the question of turning upon other grounds. In this country, the tendency, in recent years, has been to consider, with Dr. Robert Lee, that turning should rarely be practised. I believe the cases in which version is the proper operation, simply on account of funis presentation, are rare; but there are other contingencies, such as moderate contraction of the pelvis, cases where the pelvis is capacious, where other means have been tried in vain, and where turning can be easily performed, but where there is evidence that the child is passing into a dangerous state, in which the operation of turning may save fœtal life without more than very slight additional hazard to the mother.

In cases where the labour has sufficiently advanced, the use of the Forceps or the Vectis, the administration of the ergot of rye or a stimulating enema, are of great value in completing delivery. These means are to be reserved for those cases in which prolapsus occurs, or continues, when the head is low in the pelvis, and the os uteri is fully dilated. In cases where the funis is complicated with breech or footling presentation, the means described when speaking of breech cases, for effecting delivery and preserving the child, should be practised.

When the cord remains pulseless and flaccid for a considerable time, we may conclude that the child is already dead, and we may save ourselves from anxiety or attempts at delivery on account of the fœtus. We must not, however, be in too great a hurry to consider the child beyond hope. Cases are on record in which the cord being pressed upon from above, the loop hanging down is pulseless from pressure on the arteries, but the heart may beat for a considerable time after this, and the child ultimately be born alive. Sometimes in the conduct of these cases, the cord will almost cease to pulsate and the heart of the child will become very feeble, but nevertheless, from some alteration of position, the heart rallies and the pulsation of the cord is restored. Those cases in which the cord comes down with the head, most easily admit of the reposition of the cord, whereas, in breech cases, the cord has a great tendency to come down after its replacement. Although when the cord descends before the rupture of the liquor amnii, the child is in no danger as long as the membranes remain intact, such cases are very dangerous to the child from the length of time during which it is generally subjected to pressure. On the contrary, when the cord descends towards the completion of labour, the risks of the child are less, because we generally have it in our power to complete delivery within a given time in such cases. The length of time the cord may prolapse in some cases without destroying the child, is extraordinary. I once knew a case where it was prolapsed three whole days, but was afterwards reposited, and the child was born alive.

CHAPTER XXX.

PLACENTAL PRESENTATION.

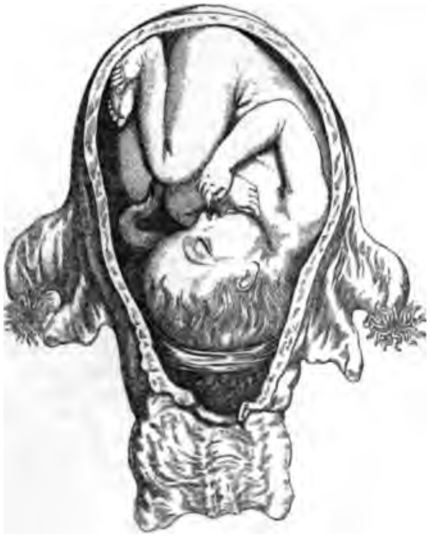
THE subject of Placenta Prævia is related both to the varieties of Presentation, and, in its most dangerous symptom, to the different forms of Hæmorrhage. Still, as it is undoubtedly one of the forms of presentation, and as its attendant hæmorrhage is peculiar and in many respects distinct from ordinary flooding before or after delivery, I prefer to consider it in the present place, having already treated of the different forms of presentation belonging to the head, trunk, and extremities of the fœtus, and prolapsus of the cord.

The natural site for the attachment of the placenta is either the right or left side of the cavity of the fundus uteri, generally the right. It is only rarely attached to the anterior or posterior walls of the uterus, in a central position. It may also be attached to the uterine walls in the middle portions of the organ, between the fundus and the cervix. In placenta prævia, ordinarily so called, it is attached over the whole of the os and cervix uteri, or it may be implanted over some part of the margin of the os, and one half or more of the cervix. The one has been termed Placenta Centralis, the other Placenta Lateralis. When the placenta is attached to the lower part of the uterus, it is observed that the placenta is generally of greater superficial size than when it is developed at the fundus. This probably depends on the greater relative expansion of the cervix uteri, during the latter months, as compared with the fundus. The cause of the attachment of the placenta to the lower segment of the uterus, is at present undetermined. Dr. Barnes, in his admirable "Lettsomian Lectures," has advanced the supposition that the chorionic envelope of the ovum is, in the early months, in intimate and vascular relation with the decidua vera in its entire superficies, and that various accidental circumstances may determine the site at which the united chorion and decidua may be developed into the placenta. I submit, however, that although in the middle and latter months the chorion is everywhere in contact with the decidua vera, it is not so up to the second month, at, and prior to which time, the site of the placenta has been determined. Up to this period, the ovum hangs in the cavity of the decidual lining of the uterus, attached to it only at one point—namely, that in which the placenta is in process of development, so that the view advanced by Dr. Barnes can hardly be the real cause of placenta prævia. Legroux adverts to the fact that placenta prævia is most frequently met with in multiparous women, and supposes that it arises from the greater extent of the uterine cavity in such cases, which allows the ovum to spread its attachments lower than natural. My own opinion is, that placenta prævia is caused by the impregnation of the ovule, or at least the arrest of the impregnated ovule, after it has descended through the Fallopian tube and uterus, so as to reach the upper part of the cervix uteri, this being the last point at which the ovule retains its capability of impregnation and attachment to the uterine surface. In some women there is a disposition to the repetition of placenta prævia in successive pregnancies. In such cases it would appear that the decidual surface of the upper part of the cavity of the fundus could not receive or support the ovum. We know that in cases of Fallopian gestation, the impregnated ovule attaches itself to the decidual lining of the Fallopian tube. There is no more difficulty in supposing that, instead of being arrested or impregnated in the tube, or in the fundus, it may in some cases pass on to the lower part of the cavity of the uterus, the point at which it joins the cervical cavity, in which case we have placenta prævia.

Up to the fifth month, the development of the ovum generally proceeds in the ordinary manner in placenta prævia, and if abortion occurs before this time, there is nothing which distinctly indicates the site of the placenta. After this date, the development of the cervix proceeds, and, in its expansion, partial separation of the placenta from its attachment is prone to occur. The irritation of the uterus by the placental attachment to the cervix, and the separations which occur, often lead to abortion or to delivery before the natural term in these cases. Sometimes patients go on to the full term when suffering from this complication, without the occurrence of hæmorrhage before the commencement of labour.

The symptoms of placenta prævia in the latter months are usually sufficiently distinctive. Occasional hæmorrhage occurs, generally between the seventh month and the end of gestation. The discharge commonly takes place suddenly, without pain, and ceases after a while, or the drain may continue for a considerable time. The nearer the patient is to the full term, the more violent is the loss of blood. The gush may take place after some exertion, or when the patient is following her usual avocations, or when she is asleep. The loss is sometimes so sudden and so enormous, that the woman is dead before the medical attendant can be summoned. Generally, there are several sudden losses, to a less extent, before the advent of labour. Flooding may recur at variable intervals, of a few days, a week, a fortnight, or it may break out at the dates of the catamenial periods. Placental presentation should always be suspected whenever hæmorrhage occurs in the latter part of pregnancy. Sometimes labour comes on after the first discharge; at others, there are no traces of uterine action until after several attacks of flooding. There are no sensations belonging to the patient herself which indicate malposition of the placenta, but the uterine soufflet is heard in these cases with most distinctness in one of the iliac regions, or the hypogastrium. When we examine internally, if the os uteri has dilated, the soft mass of the placenta can be felt between the finger and the presenting part of the child. The soft placentary layer may be felt in the entire field of the os uteri, or occupying only one margin of the os. If the flooding has been very severe, a portion of the placenta, or the greater part of the organ, may be felt protruding through the os uteri. When the os is quite closed, the placenta can sometimes be distinguished through the walls of the expanded cervix, particularly if the head presents, and the placenta lies between the finger and the fœtal cranium. In the case of breech or shoulder presentation, the detection of the placenta is more difficult. If the os uteri should be are so unfavourable to the safety of the patient, that such reliance is worse than on a broken reed. This conjuncture offers little place for a Fabian plan of treatment. To wait, is generally to destroy. In a case of placenta prævia we have the circumference of the os and cervix studded with large vessels, the mouths of which gape widely open as the placenta separates, and the os and cervix dilate. And this separation and dilatation must occur. There is no escape from them, and the slow and gradual way in which the preparation for the exit of the fœtus is generally made, and which in ordinary cases tends so much to the safety of mother and child, is here their destruction. The hæmorrhage in cases of placenta prævia has been called "unavoidable" hæmorrhage,

FIG. 129.



Entire placenta prævia.

mother and child. In some cases of partial placental presentation, the head may be so low, that the use of the forceps will be preferable to turning; or this operation may become necessary after the spontaneous or artificial expulsion of the placenta. In other cases, as when the head is low, and the child dead, or when the pelvis is deformed, craniotomy may be called for. Dr. Radford has advised the use of electricity, in connexion with the other methods of treatment, in these cases.

I have now to refer to the Artificial Extraction of the Placenta before the birth of the child, which has certainly been one of the most prominent points in obstetric practice during the last ten or twelve years. It is one the settlement of which is of great interest, as nothing can be more unsafe than halting between two opinions upon such a subject. From an early period, it had been remarked by accoucheurs that cases of unavoidable hæmorrhage were occasionally met with, in which the placenta was expelled spontaneously before the birth of the child, and that others occurred in which the hæmorrhage was arrested by the spontaneous separation of the placenta. The first person who seemed to have pointed out the deduction of a rule of practice from such cases was Mr. Chapman, of Ampthill. The placenta was also removed, in some cases of placenta prævia, by Mr. Kinder Wood, of Manchester, and subsequently by Dr. Radford. Probably cases have always occurred in which accoucheurs, finding the placenta loose in the vagina, or almost entirely detached, have removed it. Dr. Simpson took up this subject in 1844, and, with his usual ability and force, pointed out what he considers the advantages of this operation, the principles upon which it is founded, and the cases to which it is applicable. The tenor of Dr. Simpson's earlier writings was such as to lead to the belief that he wished to supersede in great measure the operation of turning, by the separation and extraction of the placenta. This impression has continued to a great extent up to the present time, and it is upon this impression chiefly that its opponents have attacked and denounced the operation. In one of his latest publications on the subject, in "The Lancet," 1847, vol. i., he has corrected this, and insists upon the limitation of the extraction of the placenta to cases "when the other recognised modes of management were insufficient or unsafe, or altogether impossible of application," or when the old methods of practice "were attended by extreme hazard or extreme difficulty." Dr. Simpson combined with his advocacy of this practice an exposition of his views as to the source of the hæmorrhage in placenta prævia, which met with great opposition. Dr. Hamilton and others advocated the doctrine that the hæmorrhage in placenta prævia "proceeds from the separated portion of the placenta more than from the ruptured uterine vessels." Dr. Simpson endorsed this view to the full extent, and I suspect it is this, as much as the rule of practice itself, which has excited the opposition which has been manifested. According to this hypothesis, the blood lost in separation of the placenta flows from the placental cells, the supply to these cells being kept up by vessels supplying the undetached portion of placenta. It is supposed that, as the separation proceeds, the veins of the uterine surface from which the placenta is detached, are closed so as to prevent any retrogressive hæmorrhage from the uterus.

Dr. Simpson's theory of the source of the hæmorrhage, upon which he to some extent rests his practice of separating the placenta, is, I believe, altogether untenable. No proofs of the escape of the great quantities of blood lost in these cases, from the placental surface, can be given. The theory mainly rests upon the anatomical arrangement of the uterine arteries, the placental cells, and the openings upon the placental surface. No doubt there is an unobstructed channel for the flow of blood from the curling arteries, through the placental cells and the openings found upon the placental surface, when this has been separated from the uterus. But there are, as it appears to me, valid reasons why we should believe that the sudden and great gushes of blood poured out in placenta prævia do not escape in this way. The uterine arteries are of comparatively small calibre, and the openings upon the placental surface are neither large nor numerous. Supposing one-half of the placenta to be detached, it is highly improbable, I should almost say impossible, that the profuse loss frequently met with in these cases could come from the uterine arteries entering the undetached portion of the placenta, even if they were all discharging blood simultaneously. In the cases of profuse loss which sometimes occur, when only a small portion of the placenta is detached, it is equally difficult to suppose that the blood could escape from the openings met with on a square inch of placental surface. There are, on the other hand, good reasons for believing that the uterine veins are the real sources of hæmorrhage in placenta prævia. The size of the venous openings, the valveless state of the uterine veins, the channel being unimpeded from the right auricle to the open mouths of the sinuses, furnish anatomical arguments in favour of this source for the flow of blood which are stronger than those derived from the anatomical arrangement of the uterine arteries and the placental sinuses, in favour of the opposite view. We have the facts connected with post-partum hæmorrhages. The only hæmorrhages comparable for suddenness and extent to the losses in placenta prævia are those which occur after labour, and subsequent to the expulsion of the placenta, in cases where it has been attached at the fundus uteri. In inversion of the uterus, after completion of delivery and the separation of the placenta, the flooding is known to be enormous. Here there can be no question but that the hæmorrhage takes place from the open mouths of the uterine veins. I have not observed any difference in the colour or character of the blood in post-partum hæmorrhages and those caused by placental presentation, and the weight of evidence is in favour of the venous character of the blood lost in placenta prævia. It is noticed that in this form of flooding the loss is increased during the pains, as it is believed, by the enlargement of the uterine openings by the dilatation of the os and cervix uteri, whereas, in hæmorrhage from the fundus, the flow of blood is arrested during the continuance of pain and contraction. When the separated portions of placenta have been examined, it has been found that the sinuses and cells have been filled with coagulated blood. In some cases of placenta prævia, in which the placenta has been detached and expelled artificially or spontaneously, flooding has occurred after the expulsion of the placenta. Here the blood must have been in great part from the uterine veins, yet the flooding presents no difference to that occurring from the partial separation of the placenta. The inference from all these facts appears to be, that in the hæmorrhage from placenta prævia the blood escapes in great part from the uterine surface, and not from the maternal surface of the placenta. There can be little doubt that some blood must exude from the surface of the placenta in cases of partial separation, whether the placenta be attached to the fundus or cervix; but I contend that this is not the chief source of flooding in placenta prævia.

Dr. W. F. Mackenzie, it should be mentioned, has investigated experimentally the question of the source of the blood, in hæmorrhage from partial separation of the placenta, and he contends for the arterial source of the loss in placenta prævia. In the case of a gravid bitch, when the placenta was detached so as to produce copious bleeding, the blood was seen to come from the uterus, and was arterial in character. In a post-mortem experiment on a pregnant woman, in whom the placenta had been partially detached, defibrinated blood was injected into the hypogastric arteries, and escaped freely from the arterial openings in the uterine walls. It may, however, be said of these experiments, that they have only a slight bearing on the question at issue. They are very valuable as tending to show that blood comes not from the placenta, but the uterus, in such cases. But the placenta in the lower mammalia does not so nearly resemble the human placenta as to admit of fair comparison, and we know that in other and equally authentic experiments, blood injected into the inferior cava gushes from the venous sinuses of the uterus. Much stress is laid on the circumstance that florid, or arterial blood is sometimes met with in cases of placenta prævia. This I believe to be exceptional, and, according to my own observation, the blood lost in these cases is chiefly venous, the arterial element being in comparatively small quantity.

While I thus take exception to Dr. Simpson's theory of the nature of hæmorrhage in placenta prævia, I do not question the correctness of the fact upon which he lays so much stress —namely, the frequent, and indeed common, arrest of the hæmorrhage on the entire detachment of the placenta. Dr. Simpson's theory does not appear to me to be necessary to the explanation of this matter. In my work "On Parturition," I pointed out that the separation of the placenta furnishes a source of irritation which excites the uterus generally, and the muscular structure at the site of the placenta especially, to contraction, and that in this way hæmorrhage was prevented. This is probably the reason why, in twins with separate placentæ, there is frequently no hæmorrhage between the expulsion of the first placenta and the birth of the second child. It is reasonable to suppose that the same thing occurs in placenta prævia, after the separation and extraction of the placenta, in the intervals which occur between the pains. The tendency to hæmorrhage from dilatation of the orifices of the veins during the pains is corrected by the descent of the head or presenting part, and the mechanical compression of the uterine walls.

Dr. Simpson unequivocally demonstrates that in a great number of cases recorded by various authors, both before and since the publication of his views, the placenta has been detached and the hæmorrhage arrested. There can, indeed, be no question upon this point. Those most opposed to Dr. Simpson, Dr. Robert Lee, for instance, record cases in which the hæmorrhage has ceased after the spontaneous expulsion of the placenta. The cases to which, in his most recent writings, Dr. Simpson would advise separation and extraction are those in which the evacuation of the liquor amnii is of no avail, and when the state of the patient is such as to call for interference; but where turning, or other measures of delivery, are impracticable, from rigidity, or non-development of the os and cervix uteri, or a high degree of distortion of the pelvis. He would also employ it in the case of dead, premature, or non-viable children, particularly when the uterus has contracted, or is so imperfectly developed as not to admit of turning. It is questionable if rigidity can be a valid plea for this operation, except in very rare cases. When the os uteri is sufficiently open to allow of the admission of the fingers for the purpose of separating the entire placenta, there will generally be room enough for the admission of the hand. I believe the separation and extraction of the entire placenta to be suitable for those cases in which it is attached all round the os uteri, and in which the exhaustion is so great as to render some more rapid attempt at assistance than the operation of turning, imperative. In some of these cases the patients would be killed by turning, if the hæmorrhage were going on simultaneously with the operation.

The extraction of the placenta offers a means of arresting hæmorrhage, and after a short rest the patient may be sufficiently rallied to bear turning; for it must be remembered that in many of the cases in which the placenta has been extracted artificially, turning has been necessary to complete the delivery. In all cases where the child is alive and viable, delivery should be effected, by turning or the forceps, as soon as possible after the extraction of the placenta, if the state of the patient is such as to bear the operation. Extraction may be sometimes useful in cases where turning is impossible, as in cases of contraction of the uterus, or great pelvic deformity, when the removal of the placenta may arrest hæmorrhage and facilitate the operations of turning, craniotomy, or evisceration. It may also be practised in some cases of dead or premature children, when the hæmorrhage is going on, and turning is difficult from any cause. When the flooding is not profuse, and when the uterus is roomy and the waters undischarged, the extraction of the placenta before the child offers no advantage whatever. The whole subject has been ably handled by Dr. Chowne, and Dr. Fleetwood Churchill gives a very candid exposition of the advantages and disadvantages of the operation.

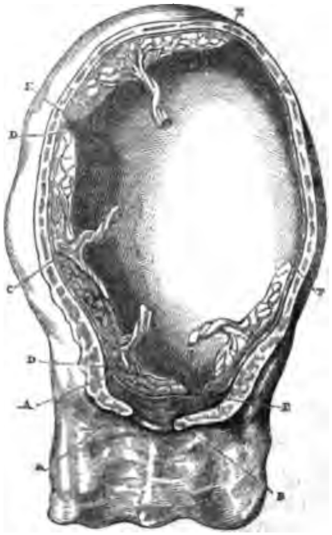
It is necessary to refer to the statistical arguments which have been advanced in favour of the operation. Dr. Simpson has given a table of 654 cases, collated from various authors, from Mauriceau to the present day, in which the treatment consisted of turning, &c., the child being extracted before the placenta. This he contrasts with another table of 141 cases in which the placenta was removed or expelled before the child. In the 654 cases, 180 mothers, or 1 in $3\frac{6}{10}$, were lost. In the 141 cases, the maternal mortality was 10, or only 1 in 14, which apparently gives a very large balance in favour of the extraction of the placenta before the child. But as it has been argued by Dr. Barnes, we cannot fairly suppose cases in which the placenta is extracted artificially, will prove as favourable as those in which it has been detached and expelled without assistance. The cases in which the placenta is expelled by the natural efforts are those in which the pains are powerful, the placenta being expelled suddenly, and the child speedily born. In the case of artificial detachment and extraction, little or no assistance from the uterus can be reckoned on. The difference is very great between the spontaneous separation and expulsion and the artificial detachment and extraction of the placenta. The published cases of extraction of the placenta are too few to found upon them any precise conclusions; and it must also be remembered that the advocates of any novel mode of practice are more prone to publish successful than unsuccessful cases. The statistics of Dr. Radford, of cases in which the placenta was removed by the hand, are, it must be mentioned, not so favourable, as regards the mother, as those of Dr. Simpson. There is little doubt that in many of the cases of supposed detachment of the placenta, when the placenta was not extracted, the detachment was only partial in character. This is evidently true of some of the cases published by Dr. Trask and other authors.

By the ordinary methods of practice, rather more than half the children are lost; and Dr. Simpson attempts to show that the mortality is scarcely more than this when the placenta was extracted before the child. He gives a table of 141 cases, of these the child was saved in 33 cases; in 79 cases it was born dead; in 1 the child was anencephalous, and died shortly after birth; in 28 cases, the result, as regards the child, was not stated. But such a state of mortality cannot be hoped for from artificial extraction. In many of the cases of spontaneous expulsion, the fœtus, membranes, and placenta are expelled by the same pain. Dr. Simpson, as Dr. Fleetwood Churchill observes, has only recorded one case of the child being born alive when the interval after the removal of the placenta was more than ten minutes. Dr. West collected 17 cases; but in 16 of them the children were lost. If this great proportion of fœtal mortality should be preserved, it must go far to prevent the adoption of extraction in any but the most unpromising cases.

Dr. Barnes has entered more fully than any previous author into the subject of placenta prævia and its treatment. He believes that in placenta centralis the action of the pains detaches the placenta in concentric rings from below upwards, until the separation is carried sufficiently high to admit of the passage of the fœtal head. This point being reached, he contends that the hæmorrhage ceases, although a sufficient amount of placenta may remain attached to allow of the preservation of the child. In placenta lateralis, also, cases are met with in which no interference takes place, but in which the placenta is detached from the os uteri and from the internal surface of the uterus to a certain extent, after which there is no further hæmorrhage. Thus there is a zone or line round the lower part of the uterine cavity, above which the placenta is tolerably safe against detachment during delivery, and below which separation and hæmorrhage are inevitable. Dr. Barnes founds upon these data the principle of practice for which he contends—namely, the artificial separation of the placenta, when the os is sufficiently open, to such a distance above the os uteri as to admit of the passage of the fœtal head, and thus save the patient from the intermittent separation and hæmorrhage produced by the pains. He

admit of turning. Hæmorrhage does not, however, in-
ariably cease on the extraction of the placenta, and by this
rocedure the life of the child is almost certainly sacrificed.
he best cases for its performance are those in which dan-
erous exhaustion exists, or when the child is already dead.

FIG. 130.



Varieties of placental attachment.

E, E. Fundal placenta.
D, D. Lateral placenta.
F, F. } C, B. } Latero-cervical placenta.
A, B. } B, F. } Seat of cervico-orificial, or central placenta.
A. } B. } Line of boundary between normal and prævial placental attachment, and consequently of spontaneous placental detachment, during expansion of cervix.

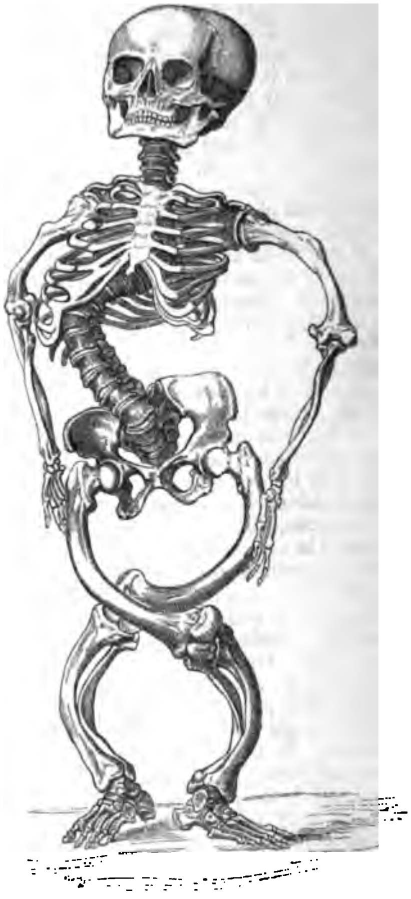
In Partial Detachment of the Placenta, there is a fair chance of saving both mother and child in favourable cases.

in this country at least, has had a very fatal history; and when the pelvis is greatly contracted, evisceration and piecemeal extraction of the fœtus is a protracted and extremely dangerous operation. The best safeguard against errors of practice, whether they consist of premature efforts to deliver, or of timorous delays, is to be found in an exact knowledge of what deviations may present themselves; how they may be recognised; how their extent may be determined approximately; and what influence they are likely to exert upon the progress of labour, so that, if necessary, dangers may be averted by the induction of premature delivery.

The conventional phrase, "deformities of the pelvis," must be held to imply something more than its etymology contains. By it we understand all deviations from the standard size and form, of whatever nature they may be, and however they may have been effected. Many attempts have been made to treat the subject of pelvic deviations systematically. Some writers have classified them according to the degree of distortion, and others according to the kind of distortion; but it is impossible to arrange them together in the same satisfactory manner as a naturalist groups plants and animals. It is better to dispose of the different deformities met with one by one, to indicate their pathological and mechanical relations, to point out how they may be recognised, and afterwards to subjoin such practical conclusions as may seem most warranted by the accumulated experience of the past. An immense variety of deviations from the natural size and form of the pelvis have been met with:—contractions of the brim, cavity, and outlet, in various directions, caused either by disease, tumours, or fractures; arrest of development, which gives us a pelvis of the infantile type; equable enlargement and equable contraction; the masculine type of pelvis; funnel-shaped pelvis; flatness of the sacrum; and oblique distortion of the pelvis, &c.

The most important pelvic deformities, perhaps, with which we are acquainted, are those which arise from Rachitis, or from Malacosteon. In the first of these diseases, distortion is produced during infancy, or at least some period anterior to puberty, and affects the pelvis in common with all the bony structures of the body (Fig. 131); malacosteon, or osteomalakia, on the contrary, is a disease of adult life. The effects produced by each of these diseases are, of course, somewhat different, although in both cases there is softening and distortion of bone, and both are in their nature inflamma-

FIG. 131.

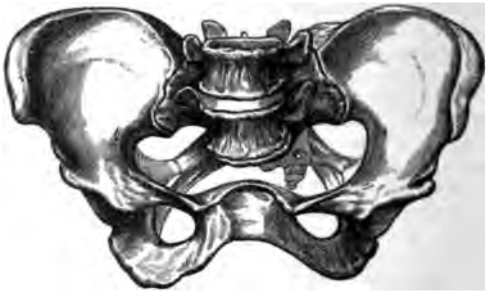


Skeleton of a rachitic dwarf with contracted pelvis.

tory. The mechanical relations of the adult and infantile pelvis are somewhat different—the width of the infantile pelvis is less in proportion to the height of the individual, than after puberty; the obliquity of the pelvis is much greater, and the heads of the thigh bones are thus in every way brought nearer to the line of gravity. The softening which takes place in malacosteon is more equable than that of rachitis—that is to say, the whole structure of a bone is similarly invaded by it, while in rickets the alteration of intimate structure affects particular portions of a bone; and, except in extreme cases, leaves comparatively solid osseous districts, which take little or no share in the torsion produced. In accordance with these facts, it will be found that rickety pelves are liable to one special kind of distortion, and malacosteon pelves to another. In the first case, the deformity produced is generally of the elliptical variety, the sacro-pubic diameter being decreased, and the lateral very much increased relatively, and sometimes absolutely. In malacosteon, on the other hand, a reversed condition obtains—the deformity is angular, the pelvis is rostrated or beaked, the sacro-pubic diameter is increased relatively to the transverse, and the transverse diameter diminished absolutely. In rachitis, the deformity takes place in early life, when the entire ossification of the pelvis is incomplete, and the pelvis gives way from the pressure of the body upon the sacrum. In malacosteon, the deformity takes place after maturity; and is caused by the pressure applied to the acetabula by the thigh bones. In one case, the pelvis is flattened from above downwards; in the other, it is compressed from side to side. This statement, however, must only be taken as a general one; for there are cases on record which show incontestably that the angular variety of distortion may take place as a result of rickets. A most remarkable case is recorded by Naegelé, in which all the characters of the osteo-malacious pelvis obtained; but there was not the slightest doubt that the disease which produced the deformity was rickets. The same authority observed two other cases, which contradicts the established belief that rachitis is not productive of angular deformity of the pelvis; and he refers to several other cases collected by competent observers. Stoltz communicated to him the cases of two children, of the ages of one and eight years respectively, in whom, although rickets had been undoubtedly the disease, yet the pelves were altogether of the form generally supposed to be peculiar to osteo-malakia. Otto, Wallach, and Von Krumbholz, mention exactly similar cases; and Burns admits the existence of angular deformity in connexion with rickets. An oblong deformity of the pelvis is sometimes met with where there is a backward curvature of the spine. In this case, the sacro-pubic diameter of the brim is very much increased; the antero-posterior diameter of the outlet is proportionately decreased, but not always.

The accompanying engravings are illustrations of characteristic specimens of rickety and malacosteon pelves respectively:—

Fig. 132.

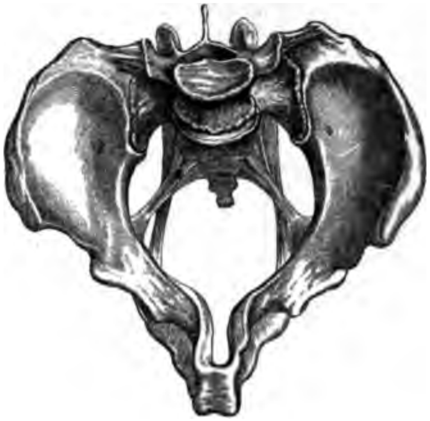


Pelvis deformed by rachitis.

Fig. 132 is a representation of a ricketty pelvis affected with the usual ovate deformity. The sacrum in such cases is placed more horizontally than natural; the promontory projects forwards and sinks, as it were, into the cavity of the pelvis, so as to bring the fourth or fifth lumbar vertebra into the position naturally occupied by itself. The sacrum is somewhat diminished in depth, though not so much so as in the case of malacosteon distortion; its vertical and lateral curvatures are both diminished, and the bone is consequently very much flattened. The apex of the sacrum and the coccyx are bent acutely forwards and inwards. The wings of the iliac bones are somewhat flattened and everted, and carried bodily forwards towards the anterior part of the pelvis. The symphysis pubis is sometimes projected inwards, so as to give the inlet of the pelvis an hour-glass shape. The tuberosities of the ischia are separated so as to increase both the transverse diameter of the outlet and the width of the sub-pubic arch.

Figs. 133—136 are specimens of malacosteon pelves. They are specimens of the oblong rostrated variety. Figs. 135 and 136 are representations of the pelvis of the celebrated Isabella Redman, seen from above and below. The general effects produced in malacosteon are, narrowing of all the diameters of the pelvis, but especially of the transverse, whether of the brim, cavity, or outlet. The antero-posterior diameter of the brim, or rather the distance from the promontory of the sacrum to the symphysis pubis, is, relatively to the transverse diameter, very much increased; absolutely, it is somewhat less than natural. The pubic arch is very much narrowed. The tuberosities of the ischia are approximated. The sacrum is very much incurvated, and the acetabula are much closer together than in the normal pelvis. The ilia, instead of being carried bodily forwards as in the rickety pelvis, are folded up, and the iliac fossa is made to resemble an oblique furrow running from above downwards.

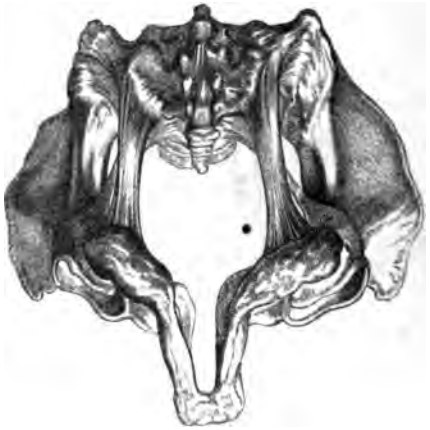
FIG. 133.



Rostrated variety of malacosteon pelvis, seen from the brim.

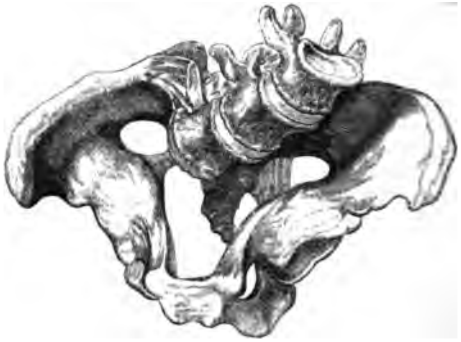
Dr. Herman Meyer, of Zurich, has elucidated the difference between rickety and malacosteon pelves most admirably in some researches, an able account of which, by Dr. Matthews

FIG. 134.



Rostrated malacosteon pelvis, as seen from the outlet.

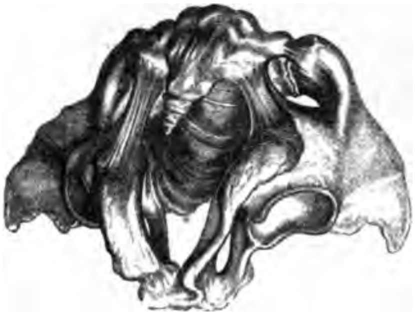
FIG. 135.



Malacosteon pelvis in extreme deformity, seen from the brim.

Duncan, is contained in the "Edinburgh Medical Journal" for April, 1856. Numerous diagrams are given by him, which

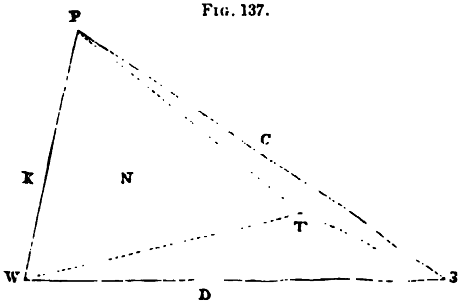
FIG. 136.



The same malacosteon pelvis, seen from the outlet.

convey more distinctly to the mind the nature of the deformities they are intended to illustrate than any merely written description. Some of these are copied in the following outlines, and others are modified with a view to their simplification. In the first place, profile sections of the pelvis are given, or rather of that part of the true pelvis which is above the middle of the third piece of the sacrum. The superior

FIG. 137.

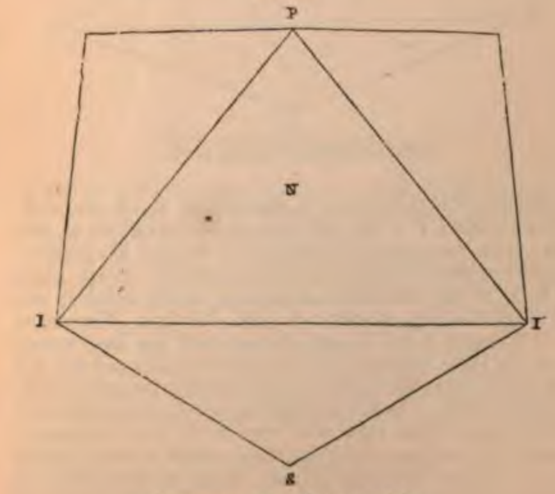


Profile section of natural pelvis.

brim to each other; and the line T W shows the relation of the middle of the ilio-pectineal line to the third piece of the sacrum. The distance between T and C in each case helps to illustrate the nature of the ilio-pubic angle. The following table will show the measurements in each case, and develope their essential differences :—

	Normal Pelvis. Millimètres.	Rickety Pelvis. Millimètres.	Malacosteon Pelvis. Millimètres.
Length of the line C	118	74	104
,, K	68	66	38
,, D	112	104	134
,, T P	78	50	49
,, T S	40	28	62
,, T W	Nearly the same in each variety.		
The distance of T below C	3	11·5	0
The distance of T above C	0	0	18

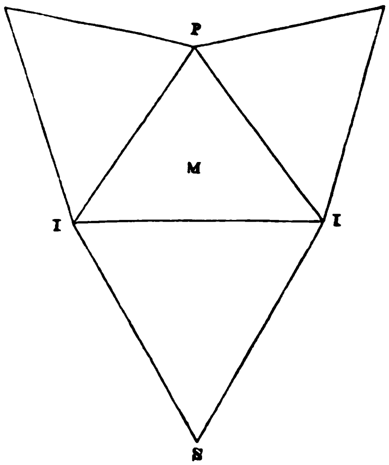
FIG. 140.



Transverse section of normal pelvis.

the folding of the iliac wings in malacosteon; they also indicate the sinking forward *en masse* of the ilia, which was spoken

Fig. 142.



Transverse section of malacosteon pelvis.

of before as taking place in rickets. It is almost unnecessary to add anything more in the way of illustration; the preceding diagrams almost explain themselves.

The pathology of the diseases which result in the two foregoing species of deformity is of considerable interest. There are many points of analogy between the intimate conditions of the bones in each case, but there are variations in the details which affect the progress, terminations, and alliances of the morbid conditions. As a general statement, however, it may be said, that both in the case of rachitis and osteo-malakia the morbid processes partake very much of the nature of inflammation.

Rachitis may be divided into three distinct periods. The first is one of rarefaction, as it is called by French pathologists; or, in other words, the structure of the bone opens up.

Thus the phenomena of this period are—first, vascularization of the bone and periosteum; secondly, slight swelling of the epiphyses and flat bones; thirdly, opening up of the osseous tissue, due to effusion of the sanguinolent matter, and absorption of the calcareous particles of the bones; and fourthly, softening of the bone, diminution of specific gravity, acquisition of unnatural elasticity, and the first indications of yielding to pressure. The second stage of the disease is marked by a still greater increase of volume, especially towards the extremities in long bones; this is more apparent than real, nevertheless, it is not correct to attribute the whole of the apparent increment of the epiphyses to atrophy of the muscles, above and below the articulations. The bones now begin to curve and yield to pressure in a very marked manner. Some of the curvatures are the result of the weight of the body itself; others are the result of muscular action, and the habitual posture of the child will materially affect the character of the distortions, especially about the pelvis. The vascularity and softening of the bones, and the opening up of the lamellæ, keep pace with the continued effusion which obtains as the disease advances. The effused matter, wherever it is poured out, becomes adherent to the surfaces with which it is in contact, and is transformed, especially towards the extremities of the bones, into a reticular, elastic, reddish tissue, like a fine sponge. It is curious to observe that the convex aspect of the bones differs very much from the concave; that it is somewhat granulated, and is sonorous when struck. The concave surface, on the contrary, is of the consistence of cartilage, or of a bone softened in acid. The touch, as well as inspection, reveals a totally different composition, and a dense but soft and elastic tissue may be recognised adhering intimately to the under surface of the periosteum; this tissue is thick on the concave surface of the bone, but is insensibly lost on the lateral aspects. The calibre of the medullary canals is considerably diminished. If the disease tends towards recovery, absorption of the calcareous portions of the bones is reduced within natural limits, and solidification takes place. The reticular tissue becomes dense, and spiculæ of bone are found in it; the lamellæ thicken, and ossification is carried on with great vigour. Towards the extremities of long bones the adventitious reticular tissue is in a great measure re-absorbed. Now, the curvatures of the bones diminish to a certain ex-

tent, but this depends upon their degree, i
development of the subject of the disease; i
not been very great, and reparation occurs
trace may be left of the disease, but opposi
hardly fail to result in permanent deformi
disease pass on to its most untoward term
structure is almost entirely destroyed, and t
dition of the skeleton is very similar to that
osteo-malakia. M. Guerin has named this co
consumption." A most elaborate account
both of rickets and osteo-malakia is to
Beylard's work on these subjects, recent
some parts of which the foregoing details are

The following rough analysis of the const
in rachitis, as compared with the normal stat
clearly as possible the nature of the orga
results in torsion and fracture :—

Rachitis—	Organic matter.	Inorganic
Rokitansky	81	19
Davy	74	26
Bostock	80	20
Normal bone in the child—		
Schreger	50	50

Osteo-malakia would appear to occur in tw
fragility of the bones is most apparent; in t
ing. In the first variety, numerous and re
occur in nearly all the long bones; in the s
is the characteristic result. Syphilis, cancer,
diathesis, have each and all been claimed by
allied diseases to the one in question. Ther
great fragility of the bones occurs in the ad
cancer, and sometimes also in syphilis whe
constitutional, but it can hardly be said that
properly so called, has any special relations
stitutional *diseases;* if any one condition is
related to it than another, it is perhaps tha
tion frequently repeated. In every gestatio
the mother has to part with a large qua
matter for the development of the fœtus. T
ties ossium appears to be more like advanced

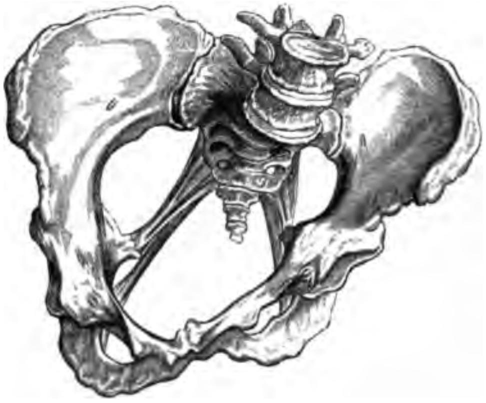
while fragilitus ossium is, according to Mr. Paget, a true fatty degeneration of bone. The worst cases of the disease are ushered in by acute pains all over the body; the urine is loaded with a whitish deposit (phosphatic), and a general cachexia appears to have invaded and taken possession of the system. As a general rule, the disease is fatal after repeated fractures of the bones have taken place, or the skeleton has become strangely distorted. The familiar engraving of Madame Supiot illustrates the extent to which the bones will yield in extreme cases. The rule as to fatality, however, is not an absolute one; for Naegelé relates a most remarkable case of a woman who had six healthy living children at the full period; between her sixth and seventh labours she became the subject of malacosteon, and such distortion of the pelvis took place that delivery had to be effected by the Cæsarian operation; the patient died. The most remarkable point in the case was that the pelvis had regained its natural density. Thus death was the result of the operation for delivery, and there is no reason to doubt that the woman would have entirely recovered had pregnancy not taken place, or the operation been rendered necessary by the previous distortion. When the disease occurs in women who are breeding, it is frequently progressive, increasing with each pregnancy. In a case reported by Dr. Cooper in the fifth volume of "Medical Observations and Enquiries," the deformity increased in such a manner as to reduce the sacro-pubic diameter of the pelvis to an inch and a quarter in the last pregnancy; the Cæsarian operation was performed, and the patient died. Barlow reports eight analogous cases in his Essays. The effects produced upon the bones in the form of disease under consideration are, alterations of form, weight, and consistence, and to these may be added fractures and alterations of the intimate structure of the bone. A brief sketch of these particulars will suffice. The alterations in form are infinitely various according to the intensity of the malady, the action of the various muscles attached to the bones, the use made of the limbs by the sufferer, the positions habitually assumed, and sometimes modifications are produced by supporting their apparatuses. Long bones curve at first in the direction of the normal flexures and at their weakest points; in a more advanced stage they assume **S**- or **Z**-shaped irregularities of form. Flat bones fold up, as it were, and are also compressed by superincumbent weight. Fractures take place generally the disease attained in the different specimens reported upon. The bone itself undergoes various changes, caused by an effusion of gelatinous matter, like that poured out in rachitis. This occupies the Haversian canals, and the medullary canal also; and as the lamellar structure is opened up, occupies the spaces between the laminæ. The areoles of the cancellated tissue are also filled with this matter; and the partitions between them are absorbed as the disease advances. A large quantity of fat is to be found in the grumous contents of the bony cylinder; and Mr. Paget is of opinion, that in a great majority of cases this quasi-gelatinous matter is indeed only disguised fat. Before the bones are reduced to this extreme point of degeneration, they may be cut with a knife, and may be even indented by the finger-nail. The laminæ, or bone corpuscles, would appear to be generally enlarged, and the canaliculi either shortened or altogether absent. Thus there is a general opening up of the structure of the bone, a vascularization and thickening of periosteum, and an effusion of adventitious matter, as in rachitis. The differences would appear to be in the occasional absence of anything abnormal in the periosteum, in the extremely fatty nature of the effusion, the absence of that fibroid organization by which the bone is supplemented, as it were, in rachitis, in the disease attacking all parts of a bone at once, and, finally, in there being, in a great many cases, some constitutional cachexia, or cause of debilitation.

Another interesting and important variety of pelvic deformity, distinct from the deformity caused by rachitis or malacosteon, is the Obliquely Distorted Pelvis, first described by Naegelé.

This eminent observer published a most laborious memoir upon the obliquely distorted pelvis, in which he described most accurately and minutely no less than thirty-seven pelves affected with this malformation. Those who desire to study the deformity will find an excellent translation of the original work, by Dr. Christie, of Aberdeen. It will, of course, be impossible to follow Naegelé throughout his laborious dissertation. We must be contented with reviewing the general characters of the obliquely distorted pelvis, pointing out the diagnosis of it in the living subject, and considering what influence it may have upon labour, and what are the pathological or other conditions out of which it arises. The following characters then are general: 1. Anchylosis, or rather fusion, mesial plane of the body, but is deflected so as to make an angle, with a vertical transverse plane joining it posteriorly, greater than a right angle on the anchylosed side, and less than a right angle on the opposite side. (Figs. 143 and 144.)

The diagnosis of an obliquely-distorted pelvis is not particularly difficult, now that we are in possession of such exact information as to the nature of the deviation. Notwithstanding this circumstance, such a distortion, unless very much exaggerated, is extremely liable to be overlooked. The subjects of this deformity are, generally speaking, well-shaped in other respects: there is no very striking diminution of their breadth across the pelvis; they are as active as other people; and there is, in fact, nothing to call attention to them, until obstructed labour reveals the condition of their pelves; always provided, as before mentioned, that the deformity is not extreme. The gait is affected when much distortion obtains. Should any suspicion of this distortion arise, we may seek for information in three ways: first, by vaginal examination; secondly, by external measurements with Baudelocque's "compas d'épaisseur;" and thirdly, by letting fall certain vertical

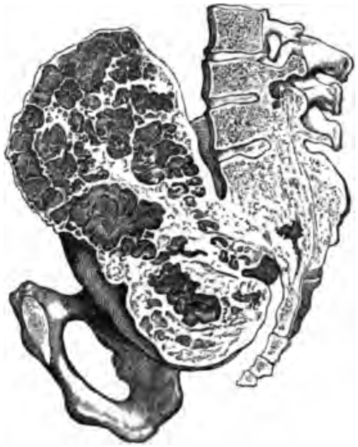
FIG. 144.



Pelvis obliquely distorted to a great extent.

being in reality something very different to what they were conceived to be by their authors. Amongst the cases of doubtful authenticity may be mentioned one which was reported as an exostosis of the upper part of the sacrum; and, in order to effect delivery, a red-hot iron was passed up to the quasi tumour, through an earthen tube introduced into the vagina. Delivery was effected in this case, but the diagnosis was probably as incorrect as the treatment was barbarous. Projection forwards of the promontory of the sacrum has usually been the condition, without doubt, mistaken for osseous tumour of the bone. In order to establish the diagnosis of an exostosis, or other growth from the internal surface of the pelvis, it is necessary not merely to explore the cavity of the pelvis, but to compare the results of such exploration with external admeasurements, and at the same time to inquire into the previous history and collateral circumstances of the patient. The consistence of bony growths in this situation is not so markedly different from that of the bone itself, as to furnish discriminatory evidence of any value. With

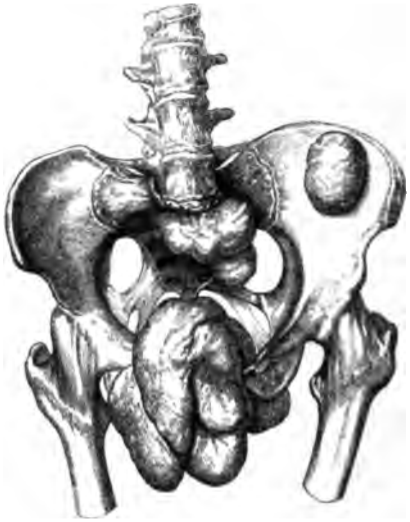
FIG. 146.



Sacral exostosis filling the pelvis.

of the sacrum is the *locus in quo* of the great majority. The influence exerted upon labour by these tumours is of course proportionate to the diminution they produce of the various diameters of the inlet, cavity, and outlet of the pelvis. Being in most cases incompressible, any operative procedures instituted for delivery must be the same as in the case of diminution of the bony passages arising from distortion. In some few instances tumours may be, and indeed have been, removed from the pelvis in the course of labour, and with perfect success; but these have been fibroid growths situated near the outlet. Occasionally it happens, in some cases of genuine exostosis, that the bony structure is so loose as to admit of being broken down during labour, either by the fœtal head or the manipulations of the accoucheur. Dr. H. F. Kilian, of Bonn, has with great ability and minuteness investigated the deformity produced by the development of spiculæ and

Fig. 148.



Cancerous growths from the bones of the pelvis, causing deformity.

crests of bone on the edges of the different symph
superior margin of the pubis, along the linea-ilic
These thorns or crests are simply a hypertrophy of th
condition of the bones, but by projecting inwards t
fere with the progress of labour, and lead to ruptu
uterus by pressing upon and wounding the organ d
course of labour. Cancerous disease of the bones of
sometimes produces serious pelvic deformity. (Fig.

The Pelvis Æquibiliter Justo Minor is the next
from the normal standard which we have to investi
its name implies, this is a symmetrical pelvis sm
natural. Three distinct varieties are met with: fi
the subject is rickety and affected with distortion of
column or limbs, the pelvis being unaffected, except
diminution of size; secondly, the true dwarf has
pelvis small even in proportion to the rest of the
and thirdly, there are numerous cases of ever-varyin
of symmetrical contraction, which appear to be w
connected with any deformity or constitutional vice
The last category of cases must be looked upon
parallel to those freaks of development which prod
heads, small hands, or small feet; probably such
are all hereditary. Whenever the ossific union bet
different portions of the innominatum at the aceta
completed prematurely, the equable contraction of t
is an inevitable result. When this departure from th
standard coexists with rachitic distortion in other pa
body, the diminution in the diameter of the pelvi
rally about one-fourth; thus the conjugate diamet
brim would measure three instead of four inches, a
diameters would be reduced in the same ratio.
opinions have been pronounced as to the frequency o
contraction of the pelvis. Dr. Fleetwood Churchill
equable enlargement to be more common than equ
traction. However this may be, it is pretty cer
diminished size of the pelvis is much oftener met w
systematic writers would have us believe. Dr. Ro
says, "About one-sixth of all the cases of difficult pa
which I have observed in London depended upon na
of the pelvis, from arrest of development, and distort
we eliminate from this estimate the comparatively r
of actual distortion, how large a number will remain
counted for as mere arrests of development? The ex

of every practical obstetrician who is not determined to find a special distortion in every case of impactment of the fœtal head, must point to this conclusion—namely, that of those cases which require the use of the forceps for the remedy of impaction within the cavity of the pelvis, a large majority are simply instances of pelves rather smaller than natural. Many serious considerations attach to the subject of equably contracted pelves; the chances are very much in favour of its not being recognised until labour has come on, or, indeed, has made considerable progress; and even when recognised, it is extremely difficult to determine the degree of diminution, or predicate the nature of the assistance likely to be necessary. When there is an obvious distortion, these difficulties are eliminated from the question, and the special deviation stands out in bold relief, as something not to be overlooked. The nature of the impediment to delivery offered by the reduction of the size of the pelvis is of a double character: there is an obstacle to descent, and an obstacle to rotation. Bearing in mind what has been said upon former occasions as to the resemblance of the internal surface of the pelvis to a female screw, it will readily be understood that a comparatively slight contraction is sufficient to derange the intra-pelvic rotations of the fœtal head; and a slight impediment to rotation is tantamount to a vastly greater impediment to direct descent, upon obvious mechanical principles.

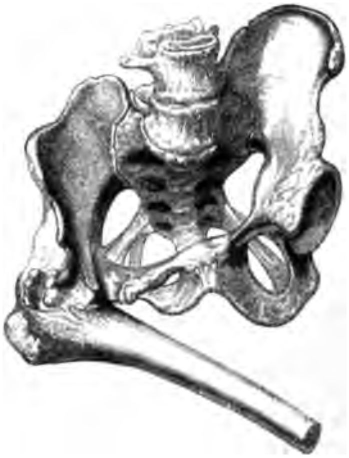
Allied to the Pelvis Æquabiliter Justo Minor are certain other forms of diminution, such as the Infantile Pelvis and the Masculine Pelvis. These abnormalities differ from the one just considered in possessing a special character. The infantile form of pelvis, besides being decreased as regards size, is more oblique in position; the antero-posterior diameter of the outlet is as great, if not greater, than the transverse; the arch of the pubis is narrower, the tuberosities of the ischia are approximated, and the whole pelvis is shallow. Such pelves as these are not always completely ossified; thus the several pieces of which the innominate bone is composed may still remain discrete, and the segments of the sacrum may not have coalesced. It occasionally happens that this type of abnormality co-exists with size equal to the adult pelvis. Dr. Murphy has described a pelvis of the infantile type, which was absolutely larger than the normal adult pelvis; the antero-posterior diameter in this case was five inches and a half, and the whole pelvis was perfectly ossified. The masculine through the pelvis will be one of advance simply, without any rotation; and this movement of advance may very well take place in such a manner as to bring the longest diameter of the fœtal head into relation with the shortest diameter of the outlet of the pelvis. The mechanism, then, of labour, where the pelvis is wider than natural, must be looked upon as something indeterminate and fortuitous. Should the fœtal head have the proper rotations accidentally impressed upon it, or should it gravitate into the proper position, labour will be easy and rapid, but it may in some cases be otherwise. It is very probable that those cases of unconscious or sudden delivery which are quoted in works on medical jurisprudence were to a certain extent connected with abnormal width of the pelvis. Narcotism arising from drugs or disease may abrogate consciousness during labour; but where neither of these circumstances obtain, diminished resistance on the part of the soft or bony passages must be looked to in explanation of the phenomena in question. The works of Dr. Taylor and Dr. Beck abound in cases of sudden and almost painless delivery, which can hardly be accounted for, except upon the supposition of there having been an enormously wide pelvis. Amongst the other effects of increased capacity of the pelvis upon the process of labour is, descent of the uterus while the fœtal head is still within the os uteri. Instances of this have been recorded, in which the fœtus has passed the external genital opening as far as the shoulders, the head being still closely invested by the uterus. Such a condition as this is obviously favourable to the occurrence of inversion of the uterus; and this latter may, in fact, be enumerated as one of the untoward circumstances to be apprehended in connexion with enlarged pelvis. Prolapse of the various viscera within the pelvis, and retroversion of the uterus, are conditions favoured, or likely to be induced, by the abnormality under consideration. The largest pelvis of this kind, whose dimensions have been recorded, is one described by Giles de la Tournette. The most important diameters were—

	Inches.
Antero-posterior of brim	5·5
Transverse of brim	6·5
Antero-posterior of outlet	5·5
Transverse of outlet	5·5

Dr. Barnes and Dr. Murphy have described pelves of o be very erratic, but to have a tendency to encroach upon he cavity of the pelvis. Dr. Lever met with a case where here was a bony projection of more than an inch into the elvic cavity, in consequence of a fracture of the acetabulum; nd Burns relates a case where a similar ossific formation esulted from a similar injury, the projection being two inches ong.

Miscellaneous deviations from a normal condition of the elvis will include, in addition to those already mentioned, rojections of various points of its osseous anatomy inwards, rithout any general vice of conformation; and the results of islocation or anchylosis of the hip-joint, arising from morbus oxarius. (Fig. 149.)

FIG. 149.



Pelvic deformity, from anchylosis of the hip-joint.

The study of the Causes of those deformities which depend n irregularity of development, particularly the Oblique Pelvis, s a subject of great interest, and one which has occupied the ttention of many obstetric authorities. This deformity has een explained in various ways, all having relations to the real r supposed laws under which the normal pelvis is developed.

The latest hypotheses have been those advanced by M
and Gavarret, Dr. Herman Meyer, and Dr. Matthew
MM. Dubois and Gavarret suppose the developm
sides of the pelvis to depend on the wedge-like p
the sacrum between the innominata. When anchyl
in one or both of the sacro-iliac synchondroses, the
the wedge-like pressure to be destroyed, and in pla
natural curve of the sides of the pelvis, the line
straightened. When the anchylosis affects one side
development of the affected side is interfered with,
other half of the pelvis is developed in a normal ma
oblique distortion is the result. When there is
anchylosis, both sides of the pelvis are straightene
deformity, instead of being oblique, is symmetri
Matthews Duncan controverts these views of Gav
strongly. He maintains that the lateral curve of
is produced by the pressure of the trunk above, and t
extremities below, upon the sacral and cotyloid en
beams formed by the ilia. I believe the mechanical
pointed out by Dubois and by Dr. Matthews Dun
exist, and are effective to a considerable extent;
sacrum acts as a wedge, and that the ilia acquire a
to curve from the pressure exerted by the sacrum fr
and the femora from below; but I submit that othe
rations besides those of mere mechanical weight and
enter into the problem.

At the time of puberty we have the three perma
culations of the true pelvis—namely, the two sacro-
chondroses, and the symphysis pubis. We have
Y-shaped triple articulation between the ilium, isc
pubis on each side. These make in all nine articula
seven separate bones for the true pelvis. These bone
from the centre to the circumference; and it is to
cumferential increase, taken collectively, that the ex
the pelvis at puberty is attributable. It is not a litt
able, that the division between the ischium, ilium, a
should remain until after the completion of the dev
of puberty. The capacity of the pelvis must very mu
on the period at which the junction of these bones ta
When anchylosis takes place between the sacrum
before the period of puberty, the circumferential in
the aspects of the sacrum and ilium engaged in the

tion is impossible. Hence the arrest of growth on the anchylosed side of the pelvis upon which oblique deformity depends. This appears to me to be the chief element in the *rationale* of the oblique pelvis of Naegelé. We have, as I believe, in anchylosis of the sacrum with the pelvis on one side, at a period anterior to the full development of the pelvis, the primary condition upon which oblique distortion depends. In the description of the normal pelvis I have dwelt on the importance of the joints of the pelvis, and the divisions of the different portions of the innominata in the obstetric development of the female pelvis. If a joint should become anchylosed in any part of the body before the full development of the bones entering into its formation, it is impossible that the bones constituting the anchylosed joint can grow to the full size. This is readily seen in the case of the knee and elbow-joints, when anchylosis occurs from disease of the bones in infancy or childhood. In the case of these joints there is, in addition to the mechanical impossibility of growth, the absence of the influence of muscular exercise. In the case of the sacro-iliac articulations, if the sacrum unites by ossific deposit with the ilium of one side, the portion of the sacrum connected with the ilium cannot increase in size, and the growth of the sacral aspect of the ilium is also suspended. The portions of the two bones in the neighbourhood of the anchylosis remain, as regards size, in the condition natural to childhood, while the remaining portions of the pelvis enlarge, and the side of the pelvic cavity opposite to the anchylosis increases even beyond the natural standard. The earlier the period of life at which the anchylosis occurs, the greater the extent of the deformity. Oblique deformity of the pelvis depends, according to this view, on the combination of a portion of the pelvis of the child or young girl with a portion of the pelvis of the adult female. This combination is further moulded, to some extent, by the mechanical causes incident to the position of the pelvis in the skeleton, and by muscular action. The rare cases of anchylosis in which no deformity is observed, are probably cases in which ossific union has been delayed until after the time of puberty. The medium of union between the sacrum and ilia, and the pubic bones at the symphysis, is also very much more consolidated after than before the development of puberty. It is probable that when this consolidation and the obliteration of the Y-shaped articulation or of little import, according as the child is mature or premature, living or dead, or according as the head is large and ossification more or less perfect. In labour, it is more difficult to introduce the whole hand, but this is sometimes necessary and proper, when the head or presenting part is arrested high up in the pelvis. The single finger passed in to its utmost length and rotated within the pelvis, will seldom fail to inform us of the existence of deformity or diseased growths in the pelvis. This information having been acquired, we can introduce two or three fingers, or the whole hand, as may be necessary, to make out the special condition of the pelvis.

The Treatment of labour, complicated with deformed pelvis, varies according to the amount of impediment presented, and according to the risk in which the mother is placed by the energetic action of the expelling powers when the fœtus cannot pass through the pelvis in the ordinary manner. The aids to delivery, under these circumstances, are the Vectis, the short or long Forceps, according as the head may be arrested at the outlet or brim of the pelvis; Turning, in cases of shoulder presentation, and also in certain cases where the deformity is such as to warrant the belief that the head may be extracted, but where the forceps are inapplicable; Craniotomy, in cases where the head of the living child cannot pass, or where the continuance of labour, without assistance, endangers the life of the mother; and lastly, the Cæsarian Section, in cases where the delivery of the child by perforation and the crotchet is impossible. But before and beyond all these means, except in cases where the action of the Lever, or the compression and extraction exerted by the Forceps, is sufficient to give birth to the child alive, the remedy, or rather the preventive of danger, is to be found in the Induction of Premature Labour. A great and beneficent extension of the operation for the induction of premature labour may be made in these cases, and it is questionable, nay, almost certain, that the fatal operation of hysterotomy would rarely, if ever, be called for, if this operation were always performed in cases of distortion, and at the proper time.

The cases and circumstances under which these several procedures become necessary, in the management of labour complicated with deformity, will be entered into more fully when treating of these operations themselves in a subsequent part of the present work.

injury has resulted from the breaking down of the anchylosis, either artificially or when the accident has occurred in the course of labour; but in some cases the bony union is so firm as to render this impossible, under the disadvantages at which the accoucheur is obliged to act. In many cases of otherwise natural labour, the coccyx is bent back to such a degree as to leave a painful condition of the sacro-coccygeal articulation for months, or even years after the occurrence of labour. This state is generally relieved by counter-irritation over the sacrum.

Mechanical obstructions to the progress of labour, depending on the state of the Soft Parts of the Mother, may occur at any point of the parturient canal, between the uterus itself, and the external parts of generation. In managing such cases, we have to remove or diminish the obstructions to such an extent as to admit of the passage of the child; or we have to evade them by inducing premature labour at a time when the size of the fœtus is such as to allow of its transit. In many of these cases, other considerations besides those relating to the mechanical obstruction to delivery have to be taken into account. The obstructions themselves may depend upon constitutional states, or they may excite other disturbances apart from the impediments to labour.

When speaking of the management of ordinary labour, I have referred to those cases of rigidity of the os uteri which admit of relief without operative means. Occasionally, cases are met with where the rigidity is excessively unyielding, or in which the matter passes beyond rigidity, and there is agglutination, occlusion, or apparent obliteration of the os. This malformation may exist to such an extent that labour becomes impossible, unless rupture of the cervix takes place, or artificial assistance can be rendered. In cases of this kind, rupture of the uterus has occurred, in others the whole of the lower segment of the uterus has sometimes been separated in the form of a muscular ring, and detached from the rest of the uterus by the strength of the pains acting against an occluded os. Other patients have died undelivered, where rupture has not occurred, and where no operation has been performed.

Excessive rigidity and diminution of the os can be readily understood, but entire Occlusion is difficult of comprehension. The causes of this extraordinary state of things are, it must be of the os uteri, the unyielding os of the unimpregnated state being as it were affixed to the gravid uterus. No doubt in other cases the rigidity depends on morbid conditions of the os uteri existing before the commencement of gestation, or the result of injuries inflicted in former labours. It is now known that slight laceration of the os uteri very frequently occurs during the passage of the head, and the cicatrizations resulting from such injuries may well give rise to subsequent rigidity of the os during labour. The violent cauterizations of the os uteri practised in the present day have probably produced rigidity during labour. Mr. Thompson, of Westerham, recently published a case apparently of this kind. Adhesion and obliteration of the openings of any of the orifices of the mucous canals of the body are, it is well known, exceedingly rare. I have, however, met with a case in which, where the labour was natural, the os uteri became so perfectly occluded during the involution of the uterus, as to require the use of the hysterotome before the discharge of the catamenia could occur. In some of the most perfect cases of occluded os, it is found moreover that no signs of inflammation have existed during pregnancy. It is quite possible and probable that some of the cases of occlusion have been cases in which the os uteri was too high and directed too much backward to be reached in an ordinary examination. In a supposed case of this kind, it is very important to arrive at a correct diagnosis. Anteversion should be suspected, and the position of the uterus rectified when this state exists, before arriving at a positive conclusion. In making an examination in such a case, the finger should not be trusted to alone, since it cannot reach the os uteri, but the whole hand should be introduced into the vagina, and the posterior part of the lower segment of the uterus carefully explored. It has been found that, however small the os, if it can be detected, and the disposition to dilate imparted to it, the full dilatation is frequently effected with considerable rapidity. When other means fail, therefore, the lower segment of the uterus should be explored by the aid of the speculum, as an aperture so small as to escape the finger may become visible to the eye.

The correct treatment of such cases is a matter of great importance. When the continuance of the pains of labour for some hours, and the use of venesection, opium, emetic tartar, or chloroform, have failed to cause dilatation, and when the patient is threatened with serious symptoms, it is necessary to tumours is often difficult or impossible, unless made before the coming on of labour. The fibrous tumour is commonly more dense and irregular in shape than the ovarian. Wedged into the pelvis, these tumours not only obstruct labour, but are themselves injured and contused by long-continued compression between the fœtal head and the pelvis. In some of the fatal cases of this kind, the tumours have been found in a state of pulpy softening and disorganization. The secondary disease of the tumours has evidently, in such cases, contributed largely to the death of the patient. Cases have occurred in which, during labour, these tumours have been pushed by the hand of the accoucheur above the brim of the pelvis, so as to be removed from danger and the possibility of acting as an obstruction. In others, it has been necessary to use the forceps, to turn, or in the worst cases, to perform craniotomy. Dr. Montgomery relates one in which the obstruction was so great that the Cæsarian section had to be performed. These serious results show very conclusively that in all cases of fibrous tumours encroaching largely upon the pelvic brim, the induction of premature labour, as recommended by Dr. Ashwell, should be resorted to. Very recently I saw, with Dr. Trouncer, a case of late fibrous tumour attached lower down to the posterior wall of the uterus, complicated with placenta previa. The placenta was attached to the anterior wall of the cervix, and the anterior portion of the os. This part of the uterus was well developed, but the posterior part below the tumour was scarcely thicker than parchment. The woman was delivered by turning, and recovered, but the child was still born. After the labour, suppuration of the tumour took place.

The existence of Uterine Polypi commonly prevents impregnation, but cases occasionally occur in which gestation proceeds notwithstanding their presence, or they are developed during pregnancy, and at the commencement of labour they emerge from the uterus, and prevent the progress of the fœtus. These growths arise from the labia uteri, the interior of the cervix, or the cavity of the uterus. When they arise from the lips of the uterus, they are frequently, as observed by Dr. Heming, hollow and contain fluid; but when attached to the neck or body of the organ, are of fibrous character and of larger size. Their attachment to the os uteri, or emergence from within the orifice, can be made out without great difficulty. Polypi have sometimes been detached from the uterus less these precautions are used it may happen that complete atresia, with retention of the catamenia, may follow. Dr. Meigs has related such an instance; and recently a similar case was in St. Mary's Hospital. Besides contraction of the passage, the vagina is in rare cases blocked up by Polypoid Tumours growing from its walls. Several cases of vaginal polypi are figured by M. Huguier. In labour occurring under such circumstances, it would be necessary to puncture these tumours when they contain fluid, or to remove them, when of a fibrous structure, by the scissors or polypus hook.

The area of the vagina may be intruded on by other tumours foreign to the vagina itself. Of these, Ovarian tumours, Polypoid tumours springing from the os or cervix uteri, Rectocele or Vesicocele, Fæcal collections and Stone in the bladder are the most important.

In the complication of labour by Cystocele, the bladder, as described by the late Mr. Crosse, is prolapsed, and descends behind the pubis and before the head of the child. When full of urine it offers considerable resistance to delivery, and may itself become ruptured. This state does not, I believe, as is commonly supposed, depend on any neglect of the patient or accoucheur in evacuating the bladder, but it arises from prolapsus of the bladder existing before and independent of pregnancy. It is remedied by catheterism, but it is necessary to pass the catheter downwards and backwards in such a case. Care is required in the diagnosis of this affection, as it has happened that the distended bladder has been mistaken for the amnion, and punctured under such misapprehension.

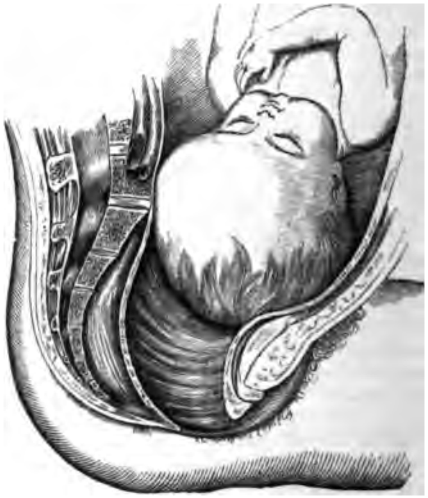
The Impaction of Fæces in the Rectum may offer considerable impediment to labour. This may depend on simple constipation, or on the accumulation of magnesian deposits in patients accustomed to take this alkali freely for the relief of heartburn or as an aperient. At first, some of these cases give to the finger the impression of exostosis, but a careful examination detects the real nature of such tumours. The remedy of course consists in the removal of the indurated mass by enemata, or, in the worst cases, by a process of excavation. It sometimes happens that the posterior wall of the vagina is prolapsed during labour, giving rise to Rectocele. In the bag thus formed fæcal accumulations may take have become distended; still better, this operation should be performed, when the nature of the case is known, during pregnancy, and such cases generally are known, because women in whom intercourse has been imperfect, mistake the signs of pregnancy for a tumour or suppression of some kind, and apply for professional advice.

The obstructions limited to the Vulva, consist of a Varicose state of the labia, Œdema of the labia or nymphæ, and Encysted or Fibrous tumours of the labia. The enlargements mentioned are generally connected with hyperæsthesia of these sensitive parts, and the suffering they occasion is usually of greater consequence than their mechanical interference with parturition. In the case of extensive œdema from the pressure of the gravid uterus in the latter part of labour, or from the existence of albuminuria, it may be necessary to puncture the skin in several places with a fine needle, as recommended by the late Mr. Ingledue, in order to let off the effused fluid, particularly when this state of things occurs in a primiparous woman. Occasionally the swelling in these cases is enormous, and it is difficult or impossible to make an examination. Sometimes fomentations will relieve the pain, and promote the relaxation of the skin to such a degree, that the fœtal head passes slowly and safely. The ergot of rye is useful in some of these cases, and is to be preferred to the forceps, as causing less risk of laceration. It is only with great difficulty that the forceps can be used in considerable swellings of the external parts, and the risk of lacerating the vulva or perinæum with the instrument is very great. When œdematous swellings of the vulva are neglected, serious consequences may ensue. Cases are recorded in which sloughing has occurred from this condition, to such an extent as to destroy the patient. In Thrombus, or in varicose states of the vulva, pressure should be exerted on the parts, or cold applied during the pains, so as, if possible, to prevent excessive dilatation and bursting and effusion into the cellular structure of the labia. It is generally at the moment when the head passes that the varicose tumour bursts from excessive distension. In cases where the effusion takes place before the termination of labour, little can be done beyond the use of pressure and cold, as the blood rapidly coagulates in the cellular tissue, and cannot be evacuated by puncture. Obstruction of the vulva from large encysted tumours (unless the contents are fluid), or fibrous tumours of the vagina, the latter of which sometimes grow

In these cases, the bones are generally thin, the fontanelles large, and the sutures membranous and gaping. Hydrocephalic children may present with the head; but, as formerly mentioned, there is in these cases a great tendency to the presentation of the pelvic extremity of the child. When the head presents in hydrocephalic cases, the symptoms are, arrest of the head above the brim of the pelvis, there being no deficiency of the expulsory action, and no pelvic or other impediment to the descent of the head on the part of the mother. When examined, the area of the cranial surface, which may be reached by the finger, is flatter than usual, conveying the impression of belonging to a larger and generally a less dense spheroid than the natural fœtal head. (Fig. 152.) Under the influence of strong pains, and when labour has been of long duration, the rounded shape of the head is altered, the edges of the cranial bones can be felt through the fontanelles or sutures; and fluid can be detected, somewhat like the fluid when the amnion is unruptured and the membranes are more dense than usual. In the irregularity and projection of the edges of the bones, the hydrocephalic head resembles the head of the premature fœtus, or of the fœtus at the full time with the head imperfectly ossified, only that in the case of hydrocephalus the size is greatly increased. When the fœtus is dead, the flaccidity of the hydrocephalic head is commonly greater than usual. When the pains relax, this sense of fluid disappears. In breech or footling cases complicated with hydrocephalus, the diagnosis is more difficult. There is in such cases a natural descent of the pelvic extremity of the body of the child until the head comes to engage in the pelvis, when a sudden arrest takes place, notwithstanding the continuance of strong and regular pains, and the portion of the head of the child which can be reached gives the impression of a large, loosely-ossified cranium. The limbs of the child are generally shrunken or wasted.

It might be supposed that in a case of hydrocephalic head, when the bones are thin and readily compressible, labour would take place easily, and without bad results. Such is not, however, the case. As just mentioned, cases do occur in which hydrocephalic heads considerably above the average circumference pass through the pelvis without assistance, but these are exceptions, and a favourable result by the natural powers cannot be depended on when the amount of fluid is large. The cause of the difficulty depends not only on the large size of the head, and in some cases upon its extensive ossification, but on the loss of the proper cranial shape under pressure, and the consequent want of due mechanical relation between the head and the screw-like arrangement of the pelvis. The head passes through as a matter of brute force, instead of in the rotatory manner natural to the well-formed fœtal head. There is not only difficulty as regards the actual passage of the head, but there is considerable danger to the mother in these cases. Left to themselves, they are very liable to be attended by serious results. The uterus may be ruptured, or the vagina lacerated, by the force of the pains; or exhaustion may be produced. The head of the child, instead of preserving any definite relation to the pelvis, is jammed into the cavity, as insisted upon by Dr. Ramsbotham, so as to fill it equally in all directions. The irregular edges of the bones are liable to

FIG. 152.



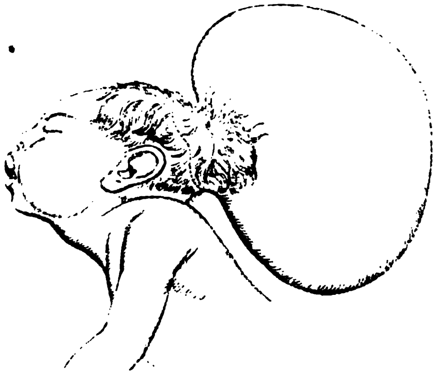
Labour impeded by hydrocephalus.

damage the soft parts, and numerous cases are on record in which inflammatory action, sloughing, and death have been thus caused. Occasionally, a spontaneous resolution of the difficulty occurs by the rupture of the head, and escape of the contained fluid under the pressure of the pains. This happens more frequently when the fœtus is dead, and partially decomposed, than under other circumstances. Dr. Robert Lee, Prof. Simpson, and others, have pointed out that in some cases there is not merely expansion of the head, but the cranial bones are greatly developed, and the sutures comparatively closed. Of course, under these circumstances the difficulties of delivery are greatly increased. Out of seventy cases collected by Dr. Thomas Keith, he remarks the significant fact that the uterus was ruptured in sixteen. The mixture of solid and fluid pressure brought to bear on the os uteri and the vagina in cases of hydrocephalic births, is perhaps greater than under any other circumstances whatever. In five cases to which Dr. Lee was called in consultation, and which are related in his Clinical Midwifery, the mothers all died, either from inflammation or rupture of the uterus; but he observes that, had perforation been performed sufficiently early, some or all of them might have been saved. In hardly any of the emergencies of midwifery are an early diagnosis and prompt action more imperatively called for.

The treatment of these cases is sufficiently simple, when an accurate diagnosis has once been made. We must evacuate the fluid when the size of the head is so great, and the progress of the labour so slow, notwithstanding effective pains, as to lead to the conclusion that the case cannot be safely left to a natural termination. In many of these cases, the child is already dead, or dies during labour, in which case all scruple respecting craniotomy will of course disappear. When the life of the mother is in imminent danger, the perforation of the head may be more cheerfully performed than in almost any other cases, as the chances of living after birth are so slight, even when most favourable, that we cannot compare them with the life of the mother, to the extent we are sometimes warranted in doing when the fœtus is strong and healthy. Every care should be taken to make out such cases with accuracy, as it would be a grievous mistake to perforate the head of a healthy fœtus, instead of a hydrocephalic child. Time should also be given to make the case clear, but without waiting so long as to endanger the serious injury of the mother.

length nine inches long. Ruysch relates one in which the tumour was as large as the head itself. I have seen a case in which the tumour was considerably larger than the head, and the subject of it lived until after the time of puberty, the cerebral development being very small. The head was carried forward, and the tumour rested on the shoulders in standing or walking. Similar tumours may form at any part of the spinal column, but they are more frequent in the cranial and sacral regions than in other parts. When not of large size they impede labour but little. In the case referred to by Dr. Meigs, and which is figured below, the head was born first, when, the tumour remaining above the pubis, the rest of the body was born by spontaneous evolution. (Fig. 153.) After this, Dr. Rohner, the attendant, was able, by powerful traction, to bring down the watery tumour without injury.

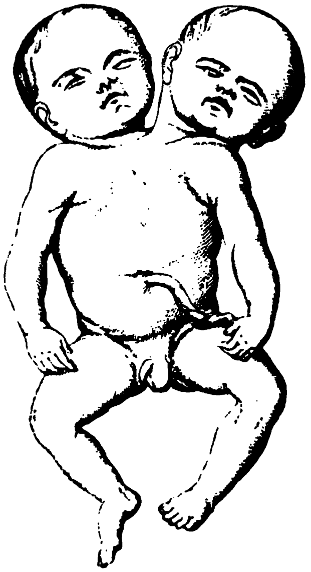
Fig. 153.



Case of crania bifida.

When speaking of the development of the serous amnion, and of the serous cavities of the body generally, by the processes of inclusion and separation of the various parts of the serous layer of the early ovum, I have mentioned that, in some cases, the same secretion or serum which is physiological in the amnion is apt to take place in the serous memtwin recently exhibited in this country, and other well-known cases, the double monsters have lived, and have even reached

FIG. 154.



Double-headed monster.

maturity. Favourable circumstances must concur to enable double monsters to be born alive. The children must be small or premature, and the pelvis full-sized. But little is known of the mechanism of parturition in monsters. In the case figured above, an account of which is related by Dr. Meigs, spontaneous evolution occurred. One head came down first; this was delivered, and became fixed against the pubic arch, when the body came down in the manner described when speaking of the process of evolution in arm cases, the second head being delivered last. Dr. Meigs points out that it can only be by this method that double monsters are generally delivered.

portion, is a common cause of difficulty. The average weight of the mature fœtus is, as remarked by Dr. Rigby, from six to seven pounds; but he refers to cases occurring in the practice of Dr. Merriman, Sir Richard Croft, and others, in which the fœtus weighed fourteen, fifteen, and nearly eighteen pounds at the time of delivery. When, in these cases, the bones of the head are ossified as much as usual, the difficulty is often very great. The largest children I have met with in practice have been in cases where, from pendulous abdomen, the fœtus had been retained beyond the full term, and in such cases the difficulty is increased by the weak action of the abdominal muscles during labour. The obstruction produced by increased bulk may be in some degree estimated by the fact that the slight difference between the size of the male and female at the time of birth, greatly increases the rate of mortality, in the case of males, both to the mother and child. In extremely rare cases, the whole of the articulations have been ossified to such an extent as to interfere with the passage of the child. Sometimes the cranial bones are prematurely ossified, so that the bones are as firm and the sutures as consolidated at the time of birth as they should be at four or five years of age. From cases of this kind which have fallen under my observation, I suspect, as I have mentioned in another place, that this may be one cause of idiocy, by mechanically preventing the development of the brain.

In twins, there is generally considerable difficulty and delay in the birth of the first child. The presence of the second fœtus causes the uterus to act upon the first at a great mechanical disadvantage. Labour in twins and triplets in the human female is somewhat similar to delivery in cases in which animals bring forth several young at a birth; but, as I have formerly remarked, there is not in the uterus and vagina of the human subject the same facilities for the descent and expulsion of successive children. In some cases, shortness of the funis, or twisting of the cord round the fœtus, forms an impediment to labour. Naegelé and some other authorities have doubted that shortness of the cord can act in this way. Plenty of cases are on record, however, in which difficult labour occurred in connexion with shortness of the funis. If the cord, as is sometimes the case, is only so long as to suspend the fœtus *in utero*, there must be a difficulty in expelling the fœtus, even if the fundus uteri follows the child, since the fœtus is curved and bent *in utero*, but is extended during its

CHAPTER XXXV.

TARDY AND PRECIPITATE LABOURS.

In a great number of the difficult cases of midwifery, we have to deal either with Excessive or Deficient Action of the Uterus and of those organs which are associated with the womb in childbirth. Sometimes this excess or deficiency depends upon other causes than the uterus itself, but in a great number of cases, inertia or excessive activity of this organ play important parts, and it will be very useful in a practical point of view to consider the nature and tendencies of the two great and opposite classes of difficult labour thus produced. They throw mutual light upon each other, when we study attentively their nature and causes, and the several accidents and complications they tend to produce.

Twenty-four hours is the time which has been accepted with nearly common consent amongst accoucheurs, as the limit beyond which a strictly natural labour should not pass. It is, however, equally agreed that little or no mischief can be caused by any ordinary extension of time in the early stage of labour, before the os uteri has dilated widely, and before the membranes have broken. The vast majority of labours are finished much within the time mentioned, especially in multiparous women, but individual cases are met with in which labour extends beyond twenty-four hours without any other morbid element saving that of simple protraction. Still the statistical inquiries of Dr. Simpson and others have proved to a demonstration that a large proportion of fatal and dangerous results, both to mother and child, is met with in cases in which labour is prolonged over the natural time, and the extent of this mortality increases according to the time to which the protraction of the labour extends. On the other hand, excessively rapid labours have their peculiar risks to the mother and child, though this class of dangerous labours is much less numerous than that depending upon protracted labour. In both protracted and precipitate labours, other matters play important parts, besides the activity and excessive action of the uterus; but the state of the uterus and expelling powers, in these cases, is sufficiently important to merit our special study.

In the chapter on the Nervi-Motor Actions of the Uterus, the nature of the expelling powers which accomplish the act of parturition has been entered upon pretty fully. The causes which interfere with these powers, so as to produce parturient inertia or excess, are very numerous and varied. Upon their proper comprehension, our means of relieving the inactivity or violence of the organ will very much depend. Let us then, in the first instance, consider the subject Tardy Labour, from inertia of the uterus, and other parturient powers.

In some constitutions, particularly those of lymphatic habit, the action and development of the uterus is naturally feeble. General debility during pregnancy, or at the time of labour, from whatever cause arising, produces inactivity of the uterus and the abdominal muscles. The uterus acts more feebly in hot than in cold climates, in the heat of summer than in winter; and some of the most distinct cases of uterine inertia to be met with in this country occur in women who have been enervated by long residence in the tropics. Age is another source of deficient uterine action. When a woman becomes pregnant for the first time towards the close of the child-bearing epoch, the pains of labour are less powerful than in the case of a younger female. In the cases I have seen of precocious pregnancy, when very young girls have become mothers, the labours have been tardy, and the pains less powerful than natural. It is also found, that in women who have borne many children in rapid succession, the powers of the uterus decline during the later labours. This is contrary to what occurs in the history of any other muscle of the human economy, and many observers of the fact have been puzzled to explain it. If, however, we take into account the gradual development of the nuclear muscular structure in the virgin, its gradual decline towards and after the end of the child-bearing epoch, and the circumstance that a new set of fibres have to be produced in the gravid uterus in each successive pregnancy, we shall readily understand why the organ of the very young gravid woman, of the patient becoming pregnant for the first time late in life, or of the multiparous woman, whose uterus has been developed and redeveloped a great many times in the space of a few years, should not be according to the most perfect type. The state of the mind in controlling uterine action is also very remarkable. The Protean influence of emotion may act as a powerful oxytocic, or it may entirely suspend the uterine action. The unexpected entrance of the accoucheur, the receipt of some sudden intelligence, a thunder-storm, or, in fact, any emotional disturbance whatever, may arrest labour in mid-career, and it may be some hours before the action of the uterus is resumed. I have seen on more than one occasion, chloroform produce tardy labour, by weakening, or for the time arresting, the action of the uterus.

Various matters relating to the position of the uterus, and the condition of the parts which are indirectly concerned in the uterine efforts, have a tendency to prevent their full development. The effects of the position of the womb are so remarkable as to have attracted the attention of the best obstetricians. In the ordinary uterine position, at the commencement and during the progress of labour, the axis of the uterus coincides with the axis of the inlet of the pelvis. In anteversion from a pendulous state of the abdomen, this correspondence between the axes of the uterus and of the upper part of the canal is destroyed, and the organ acts at a great disadvantage. The force exercised by the uterus is in the direction of its own axis, and, in anteversion, this urges the presenting part of the child, not into and through the pelvis, but against the promontory of the sacrum or the last lumbar vertebra. Under these circumstances, the action of the uterus is inefficient, and it is, moreover, less powerful than ordinary. In those rare cases of partial retroversion which continue up to the time of childbirth, the uterus also acts at a great mechanical disadvantage. Such is also the case when, from rigidity of the abdominal parietes, the use of tight stays or bandages, or other causes, the position of the gravid uterus is more vertical than it ought to be. In both retroversion and in the more common vertical derangement of the uterine axis, the imperfect pains urge the head or presenting part of the child, not into the pelvis, but against the pubic arch. Wigand has accurately described and figured these displacements as a cause of tardy labour. He shows that part of the difficulty in the case of dwarfs arises from the necessary anteversion of the gravid uterus. These results are also increased or diminished by the position assumed by the patient during labour.

In the erect position, or when the patient lies on her back, any tendency to retroversion or a vertical position is increased. When the axis of the uterus approaches the vertical performed under great disadvantages; the action of the uterus especially is liable to be imperfect, and easily exhausted or ruptured.

Inflammation of the uterus, rheumatism, gout, and neuralgia affecting the organ, sometimes retard labour to a considerable extent. The excessive suffering produced by the pains prevents their full development. Besides the positive feebleness or inertia of the uterus produced by the various causes which have been enumerated, labour is often retarded by partial contractions of the uterus. The uterus contracts under such circumstances in a spasmodic and irregular manner, or, instead of the uterus, the abdominal muscles, or the muscles of the inferior extremities, are thrown into a state of spasmodic or cramp-like contraction at each pain. The great cause of this state of things, as formerly shown by Dr. Power and other obstetricians, is intestinal irritation.

The course of labour should run in a certain definite and regular manner. At first the actions are simple, and the uterus alone is concerned. As it proceeds, it becomes more complicated, and the nervi-motor actions are more intense. The uterus, under the stimulus of labour, becomes more and more powerful, until it accomplishes delivery. But if balked in its natural course, the uterus and associated organs are very apt to fall into a state of partial inertia. Thus, a dose of opium, or too early rupture of the membranes, occurring either spontaneously or by the act of the accoucheur, will often impede labour for many hours. The same thing happens when the membranes remain too long unruptured. The uterus now refuses, as it were, to go beyond the stage of dilatation, while the liquor amnii is retained. Although as general rule the early rupture of the membranes retards labou cases occur in which the premature evacuation of the wate increases the uterine efforts. These cases occur in wome when the quantity of liquor amnii is very small, and when t puncture of the membranes at once brings the solid parts the child in full contact with the uterine parietes; or in cas of distension of the uterus by excess of the amniotic flu where the action of the uterus is simply impeded by ov distension.

In some patients labour is retarded in the propulsive expulsive stages, not only by the withdrawal of any effor volition which could aid the process, but by a perverted luntary interference with the natural course of the pains.

rare exceptions. We may hope and expect that, in the progress of obstetric knowledge, the death of women from the exhaustion consequent upon lingering labour, where the muscular powers are at fault, but where no insurmountable mechanical difficulty exists, will become impossible.

One class of tardy labours depends on faulty action of the expelling powers which act in harmony with the uterus. A variety of causes interfere with the voluntary and reflex action of the respiratory muscles. In cases of labour occurring in phthisical patients, and various diseases of the lungs, such as bronchitis, pneumonia, and pleuritis, the distension of the chest, closure of the glottis, and powerful expiratory actions of respiratory muscles, are all impeded. Sometimes labour comes on at the natural term in chronic pulmonary disease; in others, the lungs are the subject of acute disorder, and labour is excited by the local disease. In both, particularly the latter, labour is impeded, painful, and most distressing to the patient. In paraplegia, the parturient woman is cut off from the aid of voluntary and reflex respiratory action. In the various forms of cardiac disease, and in abdominal maladies, the auxiliary powers which aid the uterus in the propulsive or expulsive stages, can only be brought into operation in a very imperfect manner. In a former chapter I have spoken of ovarian and fibrous tumours as offering mechanical impediments to the passage of the child. In cases where these tumours are above the pelvic brim, the actions of the uterus and of the abdominal muscles are interfered with by the pressure and bulk of the tumours. The respiratory actions of labour are necessarily imperfect in ascites and in ovarian dropsy. General plethora, and in particular a fatty state of the omentum and abdominal parietes, also frequently interfere with both uterine and respiratory action.

The prevention of tardy labour will be best insured by preserving the course of parturition in as natural a track as possible. With this end we should attend to the time at which the liquor amnii escapes, aim at a proper harmony between the axes of the uterus and the pelvic inlet, encourage the voluntary efforts at the proper stages, and discourage them before the full dilatation of the os uteri; avoid opiates or sedatives of uterine action when there is any apprehension of feeble labour; remove intestinal or gastric irritation by an aperient or enemata and encourage vomiting; preserve the to avoid every unnecessary exertion or excitement. I have already mentioned that, in cases of inflammatory disease occurring to the gravid woman, the symptoms are preternaturally acute, and generally require decisive treatment. When the uterus is inactive from inflammatory, rheumatic, or gouty disorder, bleeding and antimonials are required.

In entire arrest of labour from failure of uterine action, when nothing is hoped from rest, we have to resort to oxytocic remedies, or to instrumental delivery. Ergot of rye, galvanism, borax, and cinnamon, are the chief agents by which we can act upon the uterus. I propose, however, to devote hereafter a chapter to the special properties of Oxytocic remedies. The ergot is of all the most powerful and certain, and in half-drachm doses of the powder, infused in boiling water, and taken every ten minutes, to the extent of three or four doses, it will generally excite the uterus, unless the tone of the organ is entirely exhausted. On account of the spastic contraction of the uterus, caused by this medicine, which interferes with the utero-placental circulation, and perhaps also from some specific influence upon the circulation of the fœtus, the state of the child should always be watched while the mother is under the influence of ergot, and delivery completed by the forceps, if the action of the fœtal heart is quickened to any great extent. In uterine inertia, as in all other cases, the os uteri must be dilated, or readily dilatable, before the ergot can be given with safety, and there should be no extra-uterine impediment to delivery. The ergot is especially suited for those cases of uterine inertia in which rapid delivery is not called for, and when the head of the child is not low down enough to render the application of the forceps easy. Dr. Vernon, the late very able obstetric resident of St. Mary's Hospital, has recently given small doses of strychnia in cases of labour marked by pure uterine atony with good effect.

Where the symptoms are urgent, as regards either the mother or the child, particularly the former, the long forceps or turning when the head is at the brim, or the short forceps or vectis when the head is sufficiently low, are called for; and in extreme cases of danger to the mother, craniotomy becomes necessary. In cases where the child is already dead, and cannot be delivered speedily by the forceps or turning, the operation of craniotomy and extraction by the crotchet should be performed. A train of serious symptoms often follows upon deliveries marked by uterine inertia. These will have than the spectacle of a woman in imminent danger of death from this form of hæmorrhage.

Let us, in the first instance, consider the circumstances under which patients are predisposed to this accident. The chief sources of flooding—namely, the open mouths of the veins on the internal surface of the uterus, from which the placenta has been separated, have already been pointed out. It has also been shown that the great natural defence against hæmorrhage lies in the efficient contraction of the uterus after delivery. Whatever tends to enlarge the venous openings, or to prevent the contraction of the whole organ, necessarily tends to the production of hæmorrhage. Thus, a large placenta, from the greater size of the utero-placental vessels, gives the tendency to flooding. For the same reason, post-partum flooding, after delivery at the full term, is far more dangerous than hæmorrhage occurring after premature labour. The circumstances which interfere with efficient uterine contraction after delivery, or produce inertia, are many of them the same as those which lead to powerless labour. Post-partum hæmorrhage is, in fact, one of the sequelæ of uterine inertia. Amongst these circumstances are, a general relaxed habit of body, weakness of the abdominal muscles, and umbilical hernia. Such conditions are frequently found in the greatest degree in women who have resided in tropical climates. They occur also in women who have borne large families, as explained when treating of uterine inertia. The uterus often flags when labour has been long delayed from any cause, whether the womb be simply inert, or worn out by prolonged action. Thus the organ frequently refuses to contract after labours in which the forceps or craniotomy have been required. The same result may sometimes, but far less frequently, spring from exactly opposite causes. After a very rapid labour, or after the extraction of the body immediately upon the birth of the head, the uterus may suddenly fail. In these cases it has not been fully and gradually roused to that powerful state of contraction which ensures the safety of the mother after delivery; or too suddenly becoming empty, it refuses to contract, just as we sometimes witness to be the case after the sudden evacuation of the liquor amnii in the beginning of labour. I have pointed out that, in labours occurring in women suffering from albuminuria, the womb often remains flaccid after delivery to such an extent as to cause dangerous hæmorrhage.

relaxation and contraction, the contractions, especially, being attended by severe pain. Sometimes great agony, without efficient muscular contraction, is felt while the uterus is being distended by coagula. There are yet other cases, in which the uterus contracts moderately, but in which there is a constant and dangerous oozing of blood. It has been said by some authorities, particularly by Gooch, that hæmorrhage may co-exist with powerful contraction of the uterus. But this is not to be received without much reservation. In such cases there is generally a retention of some portion of the placenta. It can hardly occur without some such condition, and probably Gooch was misled by cases of intermittent contraction, in which, during the flow, the uterus is often felt to be hard and firm. With the cavity of the uterus free and uninjured, and continuous contraction present, dangerous hæmorrhage from the venous sinuses is a mechanical impossibility; and it weakens our faith in the great means of arresting hæmorrhage, to believe that contraction and hæmorrhage can occur together, save under exceptional circumstances. Fulness of the circulation was formerly supposed to be a cause of hæmorrhage, the blood escaping in large quantities from the exposed extremities of the uterine arteries, after the entire or partial separation of the placenta; and bleeding from the arm was at one time advised and practised as a remedy, under the idea of diminishing the momentum of the current from the heart. Such cases rarely, if ever, happen to such an extent as to cause uneasiness, at the present day, and few persons would now dream of venesection in post-partum flooding. If such a remedy could be necessary, it is too surely in operation, from the hæmorrhage itself. Minor hæmorrhages may occur from limited lacerations of the os uteri, the vagina, and the perinæum, but these are seldom, if ever, attended by danger. Occasionally, flooding occurs to a considerable extent some hours or several days after the completion of delivery. When this occurs, it is probably similar to the losses which occur in menorrhagia. After labour, as formerly shown, the whole of the decidua is thrown off from the internal surface of the uterus, leaving a large surface from which the blood constituting the lochial discharge exudes. We can easily understand that profuse lochial flooding may occur from the detachment of masses of decidua, when we consider the larger superficies of the uterus after parturition, and that its internal surface is in much the same state as that which obtains during circumstances connected with the labour, which lead us to fear hæmorrhage, one or two doses of ergot should invariably be given during the last pains which expel the child, or immediately after its expulsion, and before the extraction of the placenta. This plan should always be followed in cases where women have, as is sometimes the case, suffered from flooding in several successive labours. Immediately after delivery in suspicious cases, the hand should be placed upon the abdomen, and kept there until efficient contraction is felt to have taken place. An abdominal bandage should be placed lightly round the body, before the completion of labour, so as to have it ready if necessary without disturbing the patient. The horizontal position should of course be strictly preserved. Sleep, immediately after labour, should not be permitted, and the vulva should from time to time be examined, to learn the amount of discharge. As soon as the uterus is found to have contracted, the abdominal bandage, with a compress of two or three folded napkins, should be applied. I have known cases where I have been obliged to attribute a fatal result from hæmorrhage to the neglect of bandaging after delivery. After the hæmorrhage has ceased, and in prolonged cases, even before this event, the action of the bandage is far more efficacious than pressure by the hand, or it may be combined with the use of the hand, as the bandage not only stimulates the uterus, but replaces the pressure of the gravid uterus.

In the Treatment of post-partum floodings, we have two things requiring instant attention, one being the arrest of hæmorrhage by uterine contraction,—the other, the sustentation of the patient under the immediate and remote effects of loss of blood. As I have pointed out in my work on Parturition, we have a good many powers to appeal to for inducing uterine contraction. There is the reflex contraction of the uterus, as when we dash cold water upon the vulva or abdomen. There is the direct spinal excitation of the uterus, when we act, not upon the excitor nerves of the surface of the body, but upon the spinal marrow itself,—as when we give ergot. There is the peristaltic action of the uterus and the contraction depending upon muscular irritability of the uterus itself, which we call into operation when we manipulate the uterus externally, or introduce the hand into its cavity, or excite it by galvanism. We can also imitate contraction of the uterus, to some extent, by mechanical compression; and we can exert pressure upon the great vessels through which such an extent as to weaken the patient. When one reflex surface is exhausted, we may often appeal to another with great effect. Thus, when cold to the vulva and abdomen has been used so long as to lose its effect, cold sprinkled on the face, swallowing a gulp of cold water, giving a patient a piece of ice to hold in her hands, a cold enema to the rectum, will each in turn excite reflex uterine contraction. Whenever coagula collect in the vagina or in the uterus, they should be turned out by the hand. Clots are a source of great irritation, and their presence tends to keep up hæmorrhage. Their removal alone will often suddenly relieve the patient of severe spasmodic pain, and stop all loss of blood. In cases of hæmorrhage, where the placenta is only partially separated, or where it is detached from the uterus, but retained in its cavity, the placenta should always be separated and removed gently as early as possible. Some practitioners have recommended, under such circumstances, that we should wait a little when the patient is much exhausted before removing the placenta, on the ground that the operation itself, and the removal of the mass of the placenta, tend to produce fatal syncope. We may wait an instant, while we pour some brandy down the patient's throat, but I have seen much mischief from delay beyond this, and never any harm from immediate and gentle action. We can make up for the removal of mere mass by external pressure, and every inch by which we reduce the size of the womb increases the patient's safety. Pressure upon the aorta and inferior cava has been recommended by many authors. This can more certainly be accomplished when the hand is in the uterus than in any other manner. In extreme cases, Transfusion has been advised, and, when other means fail, I should have no hesitation in recommending and performing it. Some time ago, a lady was under my care in whom transfusion was performed successfully by Mr. Soden of Bath, and, from the nature of the case, I have no hesitation in stating my belief that the operation saved her life. This measure seems particularly suited to cases in which patients are slowly dying, by the process of syncope, some hours after hæmorrhage has ceased.

Dr. James Arnot has recommended an apparatus by which a continuous stream of cold water can be passed over the abdomen in cases of flooding. It has also been suggested that one of M. Gariel's air-pessaries should be introduced into be excessive or repeated; otherwise, the respiration is impeded by the action of the opiate, and harm rather than good is done to the patient. I have found from experience, that less tendency to syncope is present, when the patient lies on her left side than in other positions. Fresh air should be supplied, as by fanning and open windows, and the patient kept with as little movement of the limbs as possible. After the cessation of hæmorrhage, when the effects have been severe, the patient should not be moved at all for some hours after labour, and she should not be allowed to stand, or to sit up during defecation or micturition, for many days, or even two or three weeks, after labour, and especially after eating a meal. Many patients have died suddenly from exertion of this kind, taken before they had sufficiently recovered from the loss of blood. When patients have been very much reduced by hæmorrhage, considerable discretion is called for in the introduction of food and support into the system. We must not, on the one hand, push too much nourishment rapidly, otherwise we distend the weakened vessels, and may incur the risk of apoplexy; or, on the other hand, starve the patient, or we perpetuate the state of anæmia.

There is an after-train of symptoms arising from loss of blood, consisting of reaction, particularly affecting the heart and brain, which to some extent imitates active disease. There is violent palpitation, acute pain in the head, violent throbbing of the carotids, and intolerance of light and sound. Great care must be taken not to treat such symptoms by local or general blood-letting, as has sometimes happened. A good diet, stimulants, steel, and tonics, for a continuous length of time, are required in such cases.

CHAPTER XXXVII.

RUPTURE OF THE UTERUS.

This is among the most fatal of all the accidents which attend the processes of gestation or delivery, but fortunately it is of rare occurrence. Dr. Fleetwood Churchill has collated 113,138 cases of labour, out of which number it occurred in 85, or about 1 in 1331.

the child has a considerable influence upon the occurrence of rupture. Out of 303 cases of rupture in all presentations collated by Dr. Trask, 16 were arm presentations, or 1 in 16. As the proportional frequency of arm presentations, compared with other presentations, is only about 1 in 230, we must consider that rupture of the uterus occurs relatively, in a much larger proportion of arm, than of other presentations. On the other hand, only 2 of the 303 cases, or 1 in 151, were breech presentations. As breech cases occur in about the proportion of 1 in 59 of all presentations, we must further conclude that the tendency to rupture of the uterus is less in breech than in other presentations.

It has been stated again and again by obstetric authors that women are less liable to rupture of the uterus in first than in subsequent labours; and by many it is accepted as a proved position in obstetrics, that this accident seldom occurs to primiparous women. Thus, of two of the latest and best authorities, Dr. Fleetwood Churchill and Dr. M'Clintock, the former states that "it rarely occurs with first children," and the latter that "it is a well-established fact, that women in their first pregnancies are very rarely the subjects of ruptured uterus." An appeal to statistics will modify this opinion very considerably. Dr. Churchill gives 75 cases, ranging from the first to the eleventh pregnancies, only 9 of which were in primiparous women. The particular distribution of these cases was as follows:—As already mentioned, 9 were cases of first pregnancy, 14 occurred in the second, 13 in the third, 11 in the fourth, 2 in the fifth, 9 in the sixth, and 8 in the seventh, the remaining 9 cases being divided in smaller numbers amongst other pregnancies. Dr. Trask, of the United States, collected 303 cases, ranging from the first to the seventeenth pregnancies, in which 24 occurred in the first pregnancy and labour, 18 in the second, 17 in the third, 21 in the fourth, 18 in the fifth, 16 in the sixth, and a smaller proportional number in successive gestations. Thus, out of 75 cases given by Dr. Churchill, it occurred in first pregnancies in 9 cases; and out of 303 collected by Dr. Trask, 24 happened in primiparous women. If, on the one hand, we take first labours, and compare them with subsequent labours, all grouped together, no doubt the primiparous is less liable to the accident than the multiparous woman. But if, as is the fair way of putting the case, we compare first labours with second, third, fourth labours, &c., separately, we shall find the unhappy cases in which pregnancy happens during the existence of cancer uteri, and where the patients go to the full term, lacerations almost inevitably occur during labour. It is also caused by excessive rigidity or occlusion of the os uteri, unconnected with malignant disease. Long-continued compression of the organ between the head and the pelvis, in difficult labours, tends to this catastrophe, by producing softening of the muscular structure. A considerable number of the lacerations met with in practice depend, in all probability, to some extent, upon feeble development of the uterus generally, or upon some local weakness of the organ. We must not think of the gravid uterus as an organ which is pretty much the same in all women. The uterus of every woman, and it may almost be said, of every pregnancy, differs to a considerable extent. Nothing can be more dissimilar than the thin parietes met with in one organ, and the strong development found in another. Cases are also met with in which some particular part of the uterus is thinner than in others, or in which the os and cervix have not been properly developed. These cases of preternatural thinness, or of local deficiency, account for those instances which sometimes occur of rupture from the contractions or movements of pregnancy alone, or in which laceration takes place in labours not at all remarkable for the violence of the pains, and where the head and pelvis are of normal size. There can be no doubt that in cases where the uterus is feebly developed, or weakened by disease and exhausted action, the contractions of the abdominal muscles must contribute to the rupture of the organ, by urging the head or presenting part of the child through the os uteri. Recent observations tend to show that the gravid uterus may become the subject of that fatty degeneration which is so largely concerned in its involution, and that this degeneration predisposes the uterus to rupture and laceration. The incautious use of instruments, or their most careful application when the uterus is predisposed to the accident, may cause rupture. Wherever the ergot of rye is given incautiously or improperly, the risk of ruptured uterus is incurred. When given in too large quantities, or when the os uteri is not well dilated, or when the head is larger or the pelvis smaller than natural, there is always danger of laceration. It may even be produced by improper digitation, during the course of precipitate labours. Numerous cases are on record in which the uterus has been lacerated during an examination made at the local pressure. In the majority of cases, however, there are no premonitory signs of the accident which can be depended upon. We must rely for warnings, not so much upon symptoms, as upon a knowledge of the causes which lead to this accident.

The symptoms which denote the actual occurrence of rupture of the uterus, are generally very marked, though cases sometimes occur in which the evidences of the accident are so uncertain that it cannot be positively known until after death. There is usually a sudden, sharp, and excruciating pain, sometimes accompanied by a snap, audible to the patient, and even to the bystanders. With this there is recession of the head or presenting part of the child, and a sudden arrest of the pains. If the laceration be extensive, the child commonly passes through it into the abdominal cavity, and can be felt distinctly through the abdominal walls. A coil of intestine sometimes passes through the fissure, and is felt in the vagina. There quickly ensue upon the rupture, the symptoms of collapse, and the matter ejected from the stomach is of coffee-ground colour, consisting of epithelium and blood exuded from the gastric lining membrane, or bile which has been acted on by the acids of the stomach. There is a sudden gush of blood from the vagina, and blood escapes in considerable quantity into the peritoneal cavity. Another sign of very great significance, pointed out by Dr. M'Clintock, is the sudden death of the fœtus. The action of the fœtal heart often ceases suddenly, almost immediately after the accident; so that, in suspicious cases, the stethoscope should always be used. There are various circumstances, it must be mentioned, which complicate the diagnosis. In some cases, there is no immediate pain of a violent character, but the dangerous symptoms come on some hours, or even days, after the accident. Occasionally, and particularly when the lacerations are sub-peritoneal only, the pains do not cease. Sometimes, when the rent is considerable, the pains are not arrested, and the fœtus does not pass into the perinæum; cases also occur in which the rupture only takes place as the fœtus is passing through the external parts. Sometimes the recession of the head is caused by a sudden discharge of liquor amnii, or the head of the first child may suddenly recede in twin cases. As already mentioned, the great majority of cases end fatally. Patients may die of shock, or hæmorrhage, a few minutes after the accident, or they may die after days, or even weeks of sufstrument. When the child can be delivered promptly by any of these means, the amount of shock and subsequent peritonitis is to some extent moderated. Cases, however, occur in which delivery *per vias naturales* is difficult or impossible, either from rigidity of the os uteri, or from contraction of the uterus, and especially of the aperture through which the child has escaped into the abdomen. Under such circumstances, if the woman is in a state to admit of it, and especially if the suffering be great, it is probable that chloroform may be of great use by relaxing the uterus, and thus averting the alternatives of abandoning all attempts at relief, or of performing gastrotomy. Incisions into the os uteri have been recommended with a similar intention. In this desperate condition, when the difficulty depends on contraction of the mouth of the womb, some have said the best practice is to leave the case entirely to Nature, pointing to the extraordinarily rare cases in which the child has been discharged by abscess through the abdominal walls, and the mother has recovered. Others advise the performance of gastrotomy, and the removal of the child, especially if the fœtus be alive. This is, of course, a desperate remedy. It is very questionable which of these two modes of procedure is to be preferred. In cases of great collapse, and when death is imminent, the performance of gastrotomy is not to be commended; but when the patient is strong, and delivery by other means is found to be utterly impossible, without even greater dangers than this operation holds out, I think it should be performed. We must, however, be sure of our diagnosis before venturing on so grave a step, particularly as not long since, gastrotomy was performed with this intention in the metropolis, in a case, when, on opening the abdomen, no rupture of the uterus was found!

Immediately after the extraction of the child, full doses of opium are required. During the state of collapse, stimuli should be administered, bearing in mind, however, the peritonitis which ensues if the patient survives. With respect to the general plan of treatment, it may be said that it should be very nearly the same as that to be recommended hereafter in cases of extra-uterine gestation after the rupture of the cyst. Particular points of difference in individual cases will have to be met as they arise.

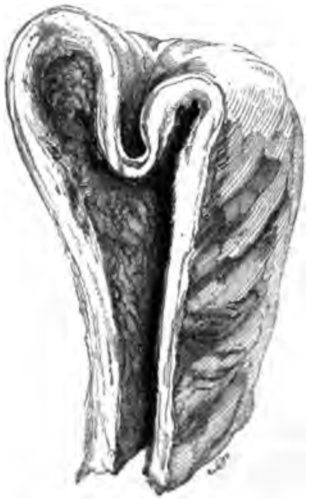
CHAPTER XXXVIII.

INVERSION OF THE UTERUS, ETC.

This accident has sometimes been attributed to irregular action of the uterus, but more generally to mechanical traction of the cord, and to injudicious attempts at removing the retained or adherent placenta. When inversion is referred to traction of the umbilical cord, whether in consequence of a short funis, the sudden birth of the fœtus while the mother is in the upright position, or the attempts of the obstetrician to remove the placenta, it is always believed to depend on the merely mechanical force which is in operation. It is considered that the fundus uteri is dragged down mechanically through the os uteri and vagina, the uterus being supposed to be passive during the occurrence of the inversion. I have always been of opinion that, in the great majority of cases, the accident happens in consequence of irregular but active contractions of the uterus itself. No doubt, cases may occur in which inversion is produced by great tension upon the cord, while the placenta is firmly adherent to the fundus, and that all violent traction of the cord while the placenta is attached to the fundus is reprehensible. But when inversion is thus produced, there must be a consenting action of the uterus. The accident has sometimes happened when the hand has been introduced to peel off the placenta from the fundus, when the hand, placenta, and uterus have all been forced out by the violence of the abnormal uterine action. All the facts connected with this catastrophe show that it generally depends, not upon a passive, but an active, condition of the organ. There are numerous points which prove that it may happen spontaneously, and apart from all interference on the part of the accoucheur. It may occur after the death of the mother, as the result of post-mortem contraction of the uterus. Numerous cases are on record in which the uterus was foun inverted before any attempt whatever had been made to remove the placenta, and while the patient was lying quietly bed. It is sometimes caused, several hours after the co pletion of labour and the delivery of the placenta, by viol after-pains. It has even been known to occur in the u pregnated uterus. I have elsewhere insisted that the unimpregnated and virgin uterus, particularly under irritation, possesses more motor power than is generally attributed to it. The nulliparous organ has been known to invert itself, as the result of spasmodic action, in long-continued menorrhagia, or as the result of a small polypus or fibrous tumour in the cavity of the uterus, or upon its peritoneal surface. The móre the subject of uterine inversion is studied, the less will the accident be referred to merely mechanical derangements.

Let us observe the steps by which complete inversion is produced. There is, first, cup-like depression of the fundus uteri; coincident with, or immediately following upon, this depression, there is hour-glass contraction of the body or lower portion of the uterus. (Fig. 156.) The annular contraction of the body of the uterus grasps the introcedent fundus as it would a foreign body, and carries it downward for expulsion

FIG. 156.



Commencing inversion of the uterus, from a preparation in the Museum of Guy's Hospital.

part of the tumour. The distinction between polypus and inversion is not so easy, particularly when the polypus is of a fibrous character, and of the same density and structure as the walls of the uterus itself. In the case of polypus, there is the sensation of a solid mass, and in inversion, that of a hollow organ is conveyed to the finger. When punctured or pricked, the uterus is said to be much more sensitive to pain than the polypoid tumour. In complete inversion the fossa round the base of the tumour is limited in extent, while in polypus the finger may be passed into the cavity of the organ, the pedicle can generally be felt, and there is the hard uterine tumour in the lower part of the abdomen. Great care is required in the diagnosis, as numerous cases have occurred in which a polypus has been mistaken for an inverted uterus, and in some instances, inversion has occurred without the accident having been recognised at all, until long after the time of labour.

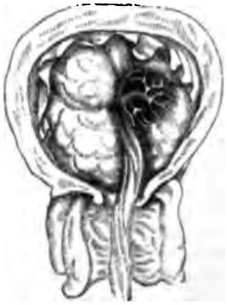
Inversion generally occurs quickly after the delivery of the fœtus, between the expulsion of the child and the expulsion of the placenta. I have known it to take place after the death of the mother, and after rupture of the uterus had occurred. In the latter case, the fœtus was passed into the peritoneal cavity, while the uterus became inverted, and protruded through the vagina. The predisposing causes of the accident are the causes of acute labour, and excessive or irregular action of the uterus. It is of very great importance to understand clearly the real nature of inversion, as it is one of those accidents which is most confidently referred to malpractice by the friends of patients. The less it is considered a mechanical displacement, the less disposition will there be to attribute its occurrence to the accoucheur. Owing to the prevalence of the mechanical idea respecting its origin, obstetricians have often been blamed most unjustly in cases of post-partum inversion.

The treatment consists in the speedy mechanical re-position of the uterus. Immediate steps should be taken to reduce the inversion, because of the rapidly increasing contraction of the os uteri, which, by impeding the circulation, causes an increase in the size of the tumour. The size of the uterus should be reduced as far as possible by pressure, and by detaching the placenta in cases where it still adheres. By moderate but sustained force the uterus is then to be passed up through the vagina and os uteri. After the organ has been partly passed through the os uteri, the muscular action of the uterus itself assists in restoring it to the proper position. It is reinstated with a sudden jerk, causing a considerable report at the moment of its restoration. In cases where intus-susception exists, the hand must be passed through the os uteri, so as to overcome the annular contraction, and to restore the intus-suscepted portion to its proper position. In all cases of sinking, with pain, the vagina should be examined with a view to ascertain whether partial inversion exists, as it is probable that it sometimes occurs and causes a fatal issue without having been detected. Cases of intus-susception and inversion require careful watching until the uterus has permanently contracted. Although it may justly be said that inversion may occur when the accoucheur is entirely blameless, I do not think the same can be said when the case is allowed to remain unreduced, and the patient lives on in a state of extreme misery and danger. It would be extremely culpable if such an accident as complete inversion either passed unrecognised, or if the first few hours after labour were allowed to pass without the re-inversion of the uterus. I cannot suppose that with proper and prompt management any case could be considered irreducible, within a reasonable time after the accident. Supposing the os uteri to be in a state of spasmodic contraction, we have in chloroform a powerful means of rendering it dilatable, and of allaying pain when the tender state of the uterus is such as to prevent the necessary manipulations. In these cases promptitude in action is of the greatest consequence. Every hour that elapses after the accident, before the reduction of the inversion is effected, increases the difficulties in the way of its accomplishment. Very rare cases are met with, in which menstruation has been normally performed with an inverted uterus, and when the presence of a tumour in the vagina and a constant leucorrhœal discharge have been the only symptoms; and cases are recorded in which the uterus has spontaneously re-inverted itself a considerable time after delivery. Usually, however, the patient is subject to an almost constant drain of blood and muco-purulent discharge from the inverted mucous surface, and she perishes miserably and after a longer or shorter interval. The alternative, when reposition is considered impossible, is, the extirpation of the inverted organ by the dangerous operations of the ligature or excision.

There are some other abnormal actions of the uterus, allied in some respects to Inversion, to which attention may now be directed.

Encysted Placenta is a term sometimes applied to cases in which a sphincteric contraction of the os uteri comes on rapidly after parturition, before the placenta has been expelled. The placenta, in these cases, may be either attached to the uterus, or it may have been thrown off, and be lying close within the contracted os uteri. This complication is most common after acute labours, or in prolonged labours, where the pains have been excessive, up to the time of delivery. Excepting that it occurs after delivery, instead of in the early stage of parturition, it is comparable to that form of rigidity, in which sphincteric contraction of the os uteri is predominant. Owing to the increased mobility which the os uteri acquires during the progress of labour, its post-partum contractions are sometimes more forcible than any active contraction which occurs before delivery; and the rigidity in this case is never mechanical, but always muscular, because of the great dilatation which has occurred during the progress of the labour. Sometimes the os uteri is contracted while the fundus is in a state of inertia, but in other cases of retained placenta there is not only contraction of the os uteri, but of the entire organ. (Fig. 157.)

FIG. 157.

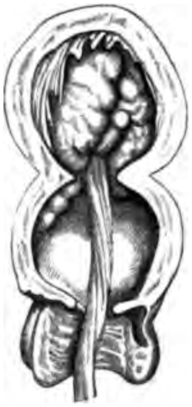


Contraction of the os uteri and the whole of the uterine cavity.

In treatment, it is of considerable importance to deal promptly with these cases. The longer the os uteri remains all cases where the first steps taken for the dilatation of the os uteri, which of themselves tend to produce uterine contraction, are ineffectual, the uterine inertia should be treated most energetically, without reference to the state of the os uteri.

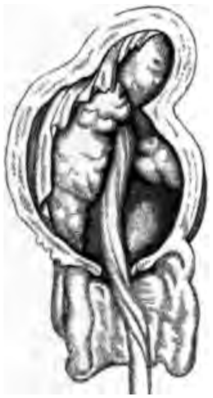
In some cases of retained placenta the uterine spasm is not situated at the os uteri, but at the junction of the cervix uteri with the body of the organ; in the same situation, in fact, as the narrow portion of the organ in the unimpregnated state, and at which the greatest resistance is met with in the introduction of the uterine sound. This state of the uterus is called Hour-Glass Contraction. (Fig. 158.) In other cases the constriction is still higher up, involving a portion of the body of the uterus or the fundus, being similar in its nature to those band-like spasmodic contractions, which are sometimes observed in the large intestine. (Fig. 159.) In the lower animals, where the uterus in its anatomy resembles an intestine, there can be no difficulty in understanding this form of annular contraction.

FIG. 158.



Hour-glass contraction.

FIG. 159.



Contraction of upper portion of uterus.

In other cases, the hour-glass contraction occurs after the separation of the placenta, when it may be the cause of in-then occurs, the fundus uteri is seized by the contracting ring of the uterus, borne down through the os uteri and vagina, and inversion is thus rendered complete. After the inversion, the os uteri, which dilates to allow the inverted uterus to pass, becomes firmly contracted. Again: all these abnormal actions, occurring after delivery, are but modifications of excessive After-Pains. In severe after-pains, it is easy to feel with the hand that the uterus becomes hard and prominent at particular points, and soft and depressed at others. From these irregular contractions the more serious irregularities of uterine action arise. Sphincteric and premature closure of the os uteri is the most simple derangement; next comes the annular contraction of the upper part of the cervix, or the body of the uterus, in hour-glass contraction; and lastly, the phenomena of inversion, which is the most compound of all these disordered actions. Thus rigidity of the os uteri, encysted placenta, inversion of the uterus, hour-glass contractions, and excessive after-pains, are merely modifications of irregular uterine action, and they are all convertible one into the other. These views materially simplify our comprehension of these post-partum accidents. It may be truly said, however, that hitherto they have generally been treated of in an isolated manner, and with little reference to uterine physiology, or to their evident relationship with each other.

CHAPTER XXXIX.

PUERPERAL MANIA.

The specific forms of mania incidental to child-bearing may occur either during pregnancy, at the time of labour, in the puerperal period, or in the course of lactation. Of these mental forms of disorder, Puerperal Mania is the most frequent and formidable.

In Pregnancy, we sometimes have the nervous symptoms met with in gestation, existing in such an aggravated form, that the balance of the patient's mind is lost, and her reason and moral faculties totter and fall for a time. This state of things is brought about by the hysterical temperament, when in a state of intense development; by improper moral management on the part of friends and relations, by neglect or disorder of the excretory functions; by hereditary predisposition to insanity, and by sudden shocks, &c. Its treatment has already been referred to, when speaking of the diseases of pregnancy, and, in the last resort, the only remedy we can depend upon is the induction of premature labour.

In the course of Labour, a nervous, excitable subject may, at any time, suffer a transient loss of reason during the height of a powerful pain attended by almost unbearable anguish. This happens most frequently, however, and for a longer time, at the moment when the head passes through the os uteri, or the os externum, and particularly the latter. I have known it also to occur at the moment of birth, in cases where the forceps have been used. It is more apt to take place in first labours than in multiparous women, and when the head of the child is of larger size than usual. Women sometimes lose their self-consciousness, or self-control entirely, and commit, if allowed, most extravagant acts, in these brief intervals of insanity. When the attack occurs at the time of the passag of the head through the external parts, patients will attem to injure the attendants or the infant; and there can be doubt that, in some cases of infanticide, where the child destroyed immediately after labour, the crime is commit while the mother is in a state of temporary and irrespons frenzy. Such cases should, however, only be received great caution. This form of mania is so transient th generally only requires the necessary amount of restraint the removal of means of mischief, for a very short perio have no doubt whatever, that such attacks of insanity always be prevented by the use of chloroform duri pains of labour, before the suffering had reached such a as to make the patient frantic.

Genuine Puerperal Mania, or that which occurs after parturition, appears to depend, in the great of cases, upon the shock of labour; the general a irritation incident to delivery, and its immediate conse and upon exhaustion and the depravation of the b duced by gestation and parturition. Except in cases in which inflammation of the brain occurs, removed from ordinary insanity, the disease is, always attended by, and dependent in great measure stitutional exhaustion.

Various circumstances predispose to the occur sanity in puerperal women. It sometimes occurs in combination with uterine inflammation, or suppression of the lochia, the metritic irritation exciting the cerebrum in a reflex form. Occasionally, mania alternates with inflammatory disorder of the uterine organs or the peritoneum, the one disease completely receding as the other becomes prominent. The existence of puerperal mania will sometimes completely mask inflammation of the pelvic organs, and even phthisis. In other cases, intestinal irritation, or the use of improper and unwholesome food, is the exciting cause of the disease, as proved by its sudden disappearance when the stomach and bowels have been efficiently relieved. Cases are met with, in which the retention of viscid and morbid secretions in the breasts has by a reflex action excited the brain to the pitch of mania. This disease is often met with in women in whom hysteria has been very pronounced during pregnancy. Hereditary predisposition to insanity, morbid fear of labour and its results during pregnancy, frights in the course of pregnancy or labour, or in the puerperal period, are important predisposing elements. The hereditary tendencies of puerperal insanity have been made out by Gooch, Burrows, Esquirol, and others. In the present day no one has devoted himself to the elucidation of this part of the subject so much as Dr. Forbes Winslow. Women belonging to families in which insanity manifests itself are liable to puerperal attacks. Several women in the same family, or two or three generations, have been known to suffer from puerperal mania, and the same woman is sometimes attacked in successive pregnancies. It is found that in times of great public excitement or calamity, or the revolutions of states, puerperal mania is rendered more common. I saw a case during the late war, in which puerperal mania was caused by the intelligence of the sudden death of a near relative. It is believed to be more common in single women whose minds are distressed by pregnancy, and the dread of loss of character, than among married women. It has a tendency to occur in women who have children very rapidly, and who nurse one child during pregnancy with another; or in women who have twins or triplets, as sometimes happens, several times in succession. I had, some time ago, a maniacal case in St. Mary's Hospital, in which the patient had had twins three times out of seven deliveries, and on each occasion had suffered from mania. I have seen cases where it had apparently depended on the use of large quantities of chloroform during labour. It has been caused by profuse hæmorrhage, occurring during delivery or after labour; or as the result of profuse bleedings in puerperal convulsions or post-partum inflammations. It also sometimes appears as the sequelæ of convulsions, in albuminuria, and the other forms of convulsive disorder met with during labour. In some cases, sleeplessness, prolonged through several days and nights, appears to be a powerful exciting cause of the disease, but the insomnia is both a cause and a symptom of the disorder, and it is difficult to say to which category the pervigilium frequently preceding insanity should be most distinctly assigned.

Puerperal mania must be distinguished, not only from phrenitis, but from pure delirium occurring during the fever incident in some cases to the first secretion of milk, or met with in the course of phlebitis or puerperal fever. The pathological lesions found after death from puerperal mania do not throw any great light upon the essential nature of the disease. No constant morbid changes are found within the head, and most frequently the only condition found in the brain is that of unusual paleness and exsanguinity. Many pathologists have also remarked upon the extremely empty condition of the bloodvessels, particularly the veins.

The attack generally comes on within a week or ten days after delivery; less frequently it comes on at the completion of labour, and continues without intermission. Sometimes it is sudden, the patient at once starting off from a state of coherence into the realm of mania; but more frequently there are some days of premonitory warning. In the latter cases, the patients are either unnaturally loquacious or taciturn: talking incessantly, and upon the most trivial and irrelevant subjects; or refusing to speak even when spoken to. There is a tendency to complain of the husband, the nurse, or to express dislike of the child, and a wish to injure it, with other signs of moral perversion. The pulse is generally accelerated; the face pale, or occasionally flushed; the eyes are preternaturally bright; there is intolerance of light, noise, or of movement in the room. There is either unbroken sleeplessness, or, if the patient sleeps, she is troubled with dreams which render sleep unrefreshing. The bowels are often confined. When this state of things passes on to actual mani there is usually the same uncontrollable and incoherent l quacity. If an attempt be made to take down the wor uttered by a patient suffering from puerperal mania, they yield, in the worst cases, not the slightest thread of coherent thought. The words or subjects of rambling talk are suggested by the objects coming before the senses, but the mind does not dwell more than an instant upon the same subject, or the words uttered by the patient herself, start successively the subjects of raving; but the prevenient words and their suggestions are as irregular and uncertain as the changing figures of a kaleidoscope, and at times the raving is an unmeaning jabber of fragments of words, or of sounds which hardly represent syllables. Sometimes, amidst an amount of incongruous raving, certain ideas are constantly recurred to, such as the birth of the child, or the belief that the child is still unborn. Very frequently the language of such patients is most obscene, and constantly turns upon sexual matters, the movements of the body and actions being such as to indicate a highly nymphomaniacal condition. Delicate ladies will use language which it would be thought impossible they could ever have had the opportunity of hearing. Sometimes events long forgotten, and even languages learned in childhood, will be remembered, of which the patient will have no knowledge subsequently. There is almost always the inclination to commit violence upon herself or others, and particularly upon the infant. Many patients are at times conscious of the suicidal or homicidal tendency, and implore those around them to defend them against their evil inclinations. When the disease becomes chronic, the tendency is generally to melancholic, rather than to other forms of derangement.

Sometimes patients refuse food altogether, or accuse those about them of administering poison, or they declare they are being starved even while they are eating ravenously. These symptoms, or groups of them, in various modes of combination, may exist for a few days, or they may continue for weeks or even months, the patient being reduced, in the protracted cases, to the utmost degree of weakness and debility. Nothing can exceed the marasmus of some of the cases of puerperal mania which spread over a long time. The state of the nervous system interferes in the gravest manner with the functions of nutrition, and the patient is worn out by incessant talking, locomotion, or such movement as is permitted, and want of sleep. In the early stages of puerperal insanity, the pulse is very quick, the skin dry and hot, the head and neck throbbing and heated, and the tongue dry; the milk and lochia are commonly suppressed. As the disease becomes chronic, the tongue becomes comparatively clean and the pulse not much above the natural standard. There is a peculiar sour smell about the breath, and the odour of the skin is very disagreeable. The bowels continue constipated. When the urine has been examined, it has been found loaded with phosphates, from the rapid disintegration or metamorphosis of the material of the brain.

The indications of Treatment in puerperal mania are the subdual of cerebral excitement, the removal of sources of reflex irritation, the repair of exhaustion, and the management of local disorders complicating the maniacal attack. The removal of the hair, the application of ice or cooling lotions to the head, blistering behind the ears, or upon the back of the neck or the scalp, and, in rare cases, a few leeches to the temples, are all that we should dare to venture upon in the way of local applications in any ordinary case. Subsidiary to these means, but scarcely of less importance in calming nervous excitement, are the avoidance of light, of noise, of conversation, and the sight of persons and things having an irritating effect upon the patient. Every stimulus of the senses and of the emotions should be suspended as far as possible. Local irritation should be removed, by drawing the breasts when these are loaded, and by the exhibition of purgatives. Cases are sometimes met with where the irritation of the brain has depended on fæcal accumulations, when a smart purge has at once and completely recovered the patient. But the cases requiring active purgatives need a nice discrimination, otherwise injury is done by weakening the patient and I have even seen cases which have arisen from excessive purgation. General bloodletting is never called for, it i hardly too much to say, in ordinary puerperal mania. The are few conditions of the economy in which bleeding is so i borne, and in which such disastrous results ensue upon i performance. Many cases are on record in which venese tion has destroyed the patient with great rapidity. Within comparatively short space of time, I saw two maniacal cas after delivery in the same district, one of which exemplifi the danger of bleeding, and the other the origin of the dise from exhaustion. In the first, symptoms of mania came a few days after delivery, and while her medical attend was shut up as a witness in a court of law, another pr tioner was called in, who, seeing the patient in a state of raving excitement, with violent throbbing carotids, bled her profusely, after which she sank rapidly, and died in spite of all attempts to rally her. In the other case, the patient, partly from principle and partly from poverty, had been a teetotaller and vegetarian, and had had children at the rate of about one a year, suckling them upon water and a scanty innutritious diet. When I saw her, a week after delivery, her mind was wandering; she had scarcely, if at all, fallen asleep, even for a moment, during the time mentioned, and she had been harassed by the constant application of the child to breasts which refused to secrete their nourishment. The anæmia in this case was extreme. Her maniacal disorder increased, and she died, no support or stimulus making any impression upon her exhausted system.

Due attention being paid to the cerebral excitement, the patient should have a full amount of support and stimulus. It often happens that digestion and absorption are remarkably rapid in these cases, and the patient suffers from an exacerbation whenever the stomach is empty, or when she is kept long without food and stimulus. In may cases, wine, porter, or brandy, can be given freely, at stated intervals, with the best effect. Ether, ammonia, hyoscyamus, and camphor, are very useful as supporting and soothing the nervous system, particularly hyoscyamus in combination with ether or ammonia. Opium is exceedingly useful, especially in cases attended by protracted insomnia. In cases most strongly marked by excitement, chloroform has been inhaled with the best effects. When the disease becomes chronic, the preparations of iron, especially the phosphate of iron, quinine, and other tonics, are necessary. In long-continued cases there is special evidence of the exhaustion of the reproductive system. Amenorrhœa commonly exists until the mental disorder gives way. Generally, the mammary secretion is arrested from an early period; but beyond relieving the breasts when they are full, no attempt at suckling should be made in these cases.

Are there any essential differences between the puerperal and other forms of mania? Some authorities of eminence have believed that no such differences exist, while others have considered the varieties of insanity connected with the reproductive functions, and particularly the puerperal disorder, so peculiar as to constitute a distinct class. The answer to the preceding question will very much depend upon whether we

The intra-vertebral causes of convulsion consist chiefly of disorders of the spinal meninges, and upon conditions affecting the substance of the spinal marrow itself. Probably excessive distension of this organ with blood excites convulsions; it is certain that the opposite condition, spinal anæmia, becomes a powerful exciting cause. In cases of irremediable uterine hæmorrhage, convulsion is the common form by which death occurs; or a convulsion may occur from loss of blood before the patient is *in extremis*. I shall, moreover, endeavour to show hereafter, that in some cases of convulsion arising from other causes, excessive bloodletting comes in at length as a cause of the fits, the therapeutics of the disease trenching distinctly upon its pathology. In animals killed by bloodletting, either by experiments or at the shambles, convulsion always occurs during the act of dying.

The state of the blood circulating in the whole of the spinal marrow, as regards its constitution, is an important cause of centric convulsion. All agencies which interfere with the proper depuration of this fluid during pregnancy, or on the approach of parturition, contribute to render the blood a morbid stimulant to the spinal system, as it circulates in the vessels of the spinal marrow and the spinal system of nerves. Such are the constipation and insufficient secretion from the bowels caused by the mechanical pressure of the gravid uterus upon the intestines. Cholæmia depending upon insufficient action of the liver, is sometimes present to a considerable extent. The state of the kidneys which exists with or causes albuminuria, accumulates urea and other noxious elements in the blood. This condition of uræmia requires a special notice, as being by far the most important and general of all the centric causes of puerperal convulsion; and I propose to consider it in a subsequent part of the present chapter. Great as its importance undoubtedly is, it is far from being the sole cause. We ought not to consider it to the exclusion of other causes of convulsions, as it has been too much the fashion to do in recent years. The encroachment of the abdomen upon the thorax must also render the due oxygenation of the blood difficult. Asphyxia invariably produces convulsions, and when it occurs during parturition, must necessarily produce this disease. The act of abortion from asphyxia seems to be almost a part of the general convulsion excited by the deprivation of oxygen, and the consequent loading of the blood by carbonic acid. There are various other sources of sanguineous impurity, all of which contribute their quota towards rendering the blood morbidly irritating to the nervous centres. It deserves to be borne in mind that the depuratory functions ought, in order to preserve health, to be increased during gestation, as the *débris* of the fœtal, as well as the maternal systems, have to be eliminated by the organs of the mother. Besides these forms of toxæmia, the state of the blood which obtains in fevers, or during the excitement of the first secretion of milk, or in poisoning, may excite convulsive disorder. In all these cases the affection of the nervous system is centric, and not reflex.

These are the chief *Physical* causes of disease; but there is another and very effective cause of puerperal convulsion which is *Psychical* in its character. I refer to the influence of Emotion.

Emotion, then, is a very important cause of centric convulsion in the puerperal state; important both on account of the severity of the attack when thus induced, the greater absence of premonitory signs, and the obstinacy of the disease as regards treatment. It is a very old and true observation, that convulsion is often met with in single women whose minds have been depressed by the sense of shame and misery inseparable from their condition during gestation. These subjects, it should be mentioned, are more prone than others to suffer from albuminuria, as they increase the pressure of the gravid uterus on the internal organs, by tight-lacing and other means of disguising their condition. But any violent emotion of the mind, whether of joy or sorrow, the agreeable or disagreeable, may also excite a convulsive attack. The return of a husband, the first sight of the infant after the hours of intense expectation, the pain and dread of parturition, or any intelligence whatever, suddenly communicated, may hurl the patient into convulsion. I myself saw a case in which a husband, returning from a distant and perilous journey a day or two after his wife's delivery, in the very act of greeting him she fell into convulsion; and instead of embracing a conscious mother, he held in his arms the rigid form of an epileptic. The fit is sometimes produced by emotional causes of a trivial character. Mauriceau related a very singular case, in which puerperal convulsion was excited by the disgust caused in the mind of a patient by the entrance into her apartment of a coxcombical friend, whose dress was powerfully scented.

Such being the principal *Centric* causes of puerperal convulsions, let us now consider the *Eccentric*, or those caused by irritation of incident, excitor nerves, acting through them upon the true spinal marrow, and its motor nerves.

First in importance is, Convulsion from Irritation of the Uterus itself and the Uterine Passages.

The statistics of labour demonstrate that puerperal convulsions occur with greater relative frequency when the head presents, than in other presentations. From this it has been inferred that its pressure on the os uteri was a principal cause; but the acute mind of Dr. Collins saw that this coincidence could not be considered as cause and effect, for convulsions frequently come on when the os uteri is entirely dilated; before the dilatation has commenced; or after delivery. Neither this eminent obstetrician nor any other has taken the pressure of the head on the vagina sufficiently into consideration, in connexion with the fact that irritation of the vagina excites more extensive reflex muscular actions than irritation of the uterus itself. This gives a physiological explanation to the fact respecting the frequency of convulsions in head-presentations with first children, the irritation of the excitor nerves of the os uteri and the vagina being undoubtedly greater under such circumstances than any other. I might adduce numbers of cases in support of this view; in fact, any case in which all remedies have been tried in vain, but in which the convulsions cease immediately after delivery, contains its proof. It must always be borne in mind, when considering the causes of excito-motor diseases, that irritation of the peripheral incident nerves is not dependent on, or to be measured by, the mere intensity of pain. It has been shown again and again that the most powerful reflex action of the *vis nervosa* may be caused without any sensation whatever; indeed, in puerperal convulsions the causes operate sometimes during a state of perfect coma, or they may commence while the patient is in a profound syncope. The term irritation, when applied to spinal action, must therefore be received with its peculiar signification.

Convulsions may be brought on by the mere presence of the fœtus *in utero*, there being no other exciting cause, or they may occur from the causes of spinal irritation depending on the first changes which take place in the uterine system preparatory to labour, before the os uteri has commenced its dilatation. They are sometimes caused by the irritation of a dead fœtus. The mere distension of the uterus by the liquor amnii, particularly in cases where there is a large quantity of this fluid, has appeared to give rise to convulsions.

When a convulsion has once happened, the fit may be repeated from causes of uterine irritation apparently trivial. Irritation of the os uteri is one of these. Denman relates the following of a case which occurred to him :—When the os internum began to dilate, I gently assisted during every pain; but being soon convinced that this endeavour brought on, continued, or increased the convulsions, I desisted, and left the work to Nature." A similar case has been related by Dr. Heming. In other cases, fits have been produced by the hand of the accoucheur in the operation of turning, or by the irritation caused by the use of instruments. Irritation of the os externum is also a powerful excitor of spasmodic action. Some women die from the violence of the convulsion caused by the passage of the child through the external parts. It has even happened that successive fits have been caused by irritation of the uterus from injudicious attempts to apply an abdominal bandage, when the irritable condition of the patient has been such as not to be able to bear it.

The following are two interesting cases of puerperal convulsions from irritation or excitation of the excitor nerves of the uterus and uterine passages, the irritation being conveyed to the spinal marrow, and reflected back on the motor nerves of the whole spinal system, so as to cause the convulsions. The first is related by Dr. Ingleby :—

"A highly esteemed friend of mine once found it necessary to pass his hand into the uterus, for the purpose of removing an adherent placenta, the ergot of rye having been previously administered. The introduction was carefully performed. *The straining and opposition to his efforts on the part of the woman were exceedingly great; and at the moment when the operator's hand had reached the organ, my own hand making counter-pressure on the abdomen,* the patient became violently convulsed, and died in less than a minute."

The second is from Dr. F. H. Ramsbotham, who relates a case of convulsions in which the fits were relieved by bleeding, and the woman remained fifty hours after the attack before labour came on. In less than five hours she was delivered without any recurrence of the fits; but as the placenta did not come away, Dr. Ramsbotham was summoned, two hours after the expulsion of the child. He remarks that, "Under no greater anxiety than usual when the placenta is retained, I proceeded in the ordinary way to remove it. *The moment I had passed my hand completely into the uterine cavity,* the patient turned upon her abdomen, and without uttering any expression of pain, went into a convulsion."

Puerperal Convulsions may arise from Irritation of Intra-cranial Excitor Nerves. It may appear a nice distinction to classify convulsions arising from cerebral pressure on the medulla oblongata, and convulsions caused by irritation of the membranes, under different heads. Yet the one is Centric, the other Eccentric. Cerebral pressure affects the medulla oblongata directly, meningeal irritation reaches it reflexly, so that some distinction is really demanded. The known intra-cranial causes of puerperal convulsion of a reflex character are, bony projections and exostoses, inflammation of the meninges, the extension of red softening of the brain to the membranes, or the extension of irritation from a coagulum in the substance of the brain. Thus, in puerperal convulsion, we have to study the brain and its envelopes under many and very important points of view; 1, as the seat of some of the most important changes which occur during the fit; 2, as the seat of an important class of centric causes of convulsion; and 3, as the source of irritation acting upon the spinal centre in reflex forms. As a reflex cause of convulsion, we must study the brain as we would the uterus, the stomach, the intestines, &c.

Irritation of the Bowels, especially of the lower part of the intestinal canal, is well known to cause convulsions under other circumstances besides those connected with the puerperal state. Thus, worms, the severe action of purgative medicines, the collection of indurated fæces in the bowel, have all been known to cause epilepsy, and the convulsions of children. It cannot therefore be wondered at, that when the excito-motor system is under the additional stimulus of either pregnancy, labour, or the puerperal state, these and similar sources of excitation should cause puerperal convulsions. Gastric irritation has long been looked on as a cause of puerperal convulsions, though the true *rationale* has not been given by obstetric writers. Irritation of the Bladder is a less frequent, though undoubted, cause of puerperal convulsions. Other causes than those which have been given occasionally operate on the spinal system, but all act in accordance with the principles already advanced. Mr. Ingleby suspected that irritation of the Mammæ might cause convulsions. Not long since, I saw a case of puerperal convulsion for which no other cause could be assigned than excessive soreness of the nipple, with mammary induration. The Skin, too, as an important excito-motor organ, must be studied in relation to puerperal convulsions. The same may be said of the Liver, and other organs supplied by the pneumogastric nerve.

Such are the principal causes of puerperal convulsions, to the *modus agendi* of all of which the physiology of the true spinal marrow goes far towards supplying a perfect explanation; and it must be remembered that, wanting this mode of solution, the disease formed, confessedly, one of the enigmas of modern pathology. To give a summary of the whole subject, the true puerperal convulsion can only occur when the central organ of this system—the spinal marrow—has been acted on by an excited condition of an important class of its incident nerves—namely, those passing from the uterine organs to the spinal centre, such excitement depending on pregnancy, labour, or the puerperal state. While the spinal marrow remains under the influence of either of these stimuli, convulsions may arise from two-series of causes: those acting primarily on the spinal marrow, or centric, causes; and, secondly, those affecting the extremities of its incident nerves, or causes of eccentric or peripheral origin. Though the subject admits of this division, several causes may act together, and centric and eccentric causes may be in operation at the same time. I have made no attempt at a division into predisposing and exciting, proximate and remote causes, because it is evident that a cause which in one case is the exciting or proximate, may in another be the predisposing or remote cause. Thus, irritation of the uterus may be the predisposing, and irritation of the stomach the exciting, cause, in one instance; while in another, irritation of the uterus is both the predisposing and the exciting cause; hence any such division must be to a great extent, arbitrary, and devoid of precise meaning. The symptoms very closely resemble those of epilepsy, except that, instead of single fits, there is a succession of convulsions.

In the Treatment of puerperal convulsions, we have to consider remedies which act on the central organ, the spinal marrow, and those which affect the extremities of incident

Marshall Hall, questions if true convulsion could ever occur without this state of the glottis, and the cerebral and spinal congestion which it occasions. We know that the epileptic attack is sometimes warded off by the dash of cold water on the face or chest, so as to excite a sudden inspiration and the dilatation of the glottis. It is on the same principle, that of exciting a strong inspiratory act, that we stimulate the nostrils or sprinkle the face with cold water in syncope. Excitation of the incident nerves of inspiration has in the same way been known to prevent the puerperal convulsion. It is probable that, in extreme cases, tracheotomy would afford relief, and I should not hesitate about resorting to this operation when the patient was in danger of dying during the fit.

Harvey gives an instance in which stimulation of the trifacial nerve within the nostrils recovered a woman who became comatose during labour. Denman also relates an interesting case, in which a convulsion was excited during every labour-pain, but in which he kept off the attacks, until delivery was completed, simply by throwing cold water on the face with a bunch of feathers at each accession of pain. It was found that this mode of proceeding, from which he augured so favourably from its effects in this and other cases, did not prove equally efficacious on all occasions. He observes, that this is "a safe remedy," which cannot be said of all measures resorted to in this disease. It must certainly be productive of benefit in cases where the glottis is not so firmly locked as to render its dilatation by this means impossible. Even if it does nothing to prevent the accession of the fit, every time we can dilate the glottis, and cause a full inspiration, we take off a considerable amount of vascular pressure from the nervous centres, and lessen the proportion of venous blood in the system.

The application of cold is a therapeutic of some importance in this disorder. Cold, applied to the head in the form of napkins, lightly wrung out of cold or iced water, ice itself, or a full stream of cold water poured from a height, has become an approved remedy in puerperal convulsions. It therefore becomes an interesting question—How does cold thus used act on the nervous system? It may act as a sedative on the cerebral portion of the spinal marrow, or it may lessen the distended state of the cerebral circulation, and thus relieve the counter-pressure of the brain on the intra-cranial portions of the spinal system. Probably it acts in both of these modes.

and repose within the sick room, and the absence of all signs of excitement on the part of the attendants, are of the utmost consequence; the calm or timid look of the professional man may either excite or prevent a fit.

During ordinary labours, care should be taken to avoid increasing the tendency to contractions of the muscles of the neck; this is still more important in labours with symptoms of spinal erethismus, or threatening convulsion. Care should be taken that, during the propulsive and expulsive stages of labour, the reflex contractions about the neck should not be increased by excessive voluntary efforts, or by violent emotional disturbance. When the neck becomes tumid at each returning pain, the reflex cervical contractions should be moderated by directing the patient, not only to withhold voluntary action of this kind, but to cry out during the pains, so as to keep the larynx open. In this way trismus, sphagiasmus, and laryngismus may be prevented by volition, in some cases. If the cervical symptoms are severe, venesection should be practised before the accession of convulsion, as a preventive measure. Whenever great fulness of the neck occurs, either before or after labour, so as to create an apprehension of convulsion, blood should be taken from the head by leeches, or by cupping. There is no point of greater importance in the prophylaxis of puerperal convulsion than an attention to the state of the cervical region; it is to convulsion what the pulse is to inflammation.

In threatened convulsion, or after the invasion of the disease, it is of the utmost importance to seek out and remove all sources of reflex irritation. Remote causes of irritation should be sought for, and removed with the greatest care. The state of the Stomach, the Intestines, the Breasts, the Bladder, and other organs in reflex relation with the uterus, should be examined. If the fit should have occurred for the first time after a full meal, or after indigestible food, an emetic of sulphate of zinc should be administered. If there should be vascular fulness, venesection ought to be performed. The bleeding should precede the emetic, to diminish the danger to the cerebrum from the action of vomiting, for emetics given incautiously have occasionally produced sudden death in puerperal convulsion. However, when the gastric irritation is undoubted, no patient should be suffered to continue in the fits with the stomach unrelieved. It may seem superfluous to urge this, but I have known cases of convulsion from gastric it. Hence, though it makes the uterus more active, by bringing its parietes into contact with the fœtus, it renders the organ itself less irritating to the general spinal system. The evacuation of the liquor amnii is to the uterus what the partial action of an emetic or an enema is to the stomach and intestines. In convulsion from uterine irritation, much may be done by the avoidance of all unnecessary dilatation and interference with the vagina and os uteri. During convulsions, all operations upon the parturient canal, whether they consist of examinations, dilatation of the os uteri, and the vagina, the artificial removal of the fœtus, or the extraction of the placenta, should be performed with the greatest care, and with the remembrance of the ease with which renewed fits may be excited by any irritation of the uterine passages.

The relation of Artificial Delivery to puerperal convulsion is a matter of deep interest. Some obstetricians have recommended that it should always be performed by turning, craniotomy, or the forceps, when the fits are obstinate and severe. In deciding this point, the particular characters of individual cases must be considered. The general principle which we may deduce is, that whenever artificial delivery can be effected with less irritation than would be produced by the continuance of the child in the parturient canal, and its expulsion by the natural process, it is advisable that it should be performed, if the situation of the mother be perilous. It must be with reference to this principle—namely, to the irritation of any particular operation, and the irritation of labour itself—that turning, craniotomy, or the forceps, must be decided upon. All these operations have destroyed patients; and, on the other hand, numbers have died undelivered, from uterine irritation. The question of interference is one for which no arbitrary rule can be laid down, but which must be decided in each individual case by its particular circumstances, due reference being had to the excitability of the uterus under the stimulus of the fœtus, and under artificial interference. The point to aim at should be, never to produce more irritation than we remove, and not to destroy the patient by an excessive temporary irritation instituted for her permanent relief, in the entire evacuation of the parturient canal. Of course, the greater the operation necessary for delivery, the greater is the deliberation necessary before it is commenced. In manipulating upon the uterus, under such circumstances, we must never lose sight of its reflex connexion with the

ressed. Its specific gravity ranges from 1010° to 1030°.
efore the occurrence of convulsions, the reflex sensibility is
icreased; but during the fits it is observed to be diminished,
nd the eye may be irritated without causing contraction of
e lid, while other parts of the body are observed to lose much
their susceptibility to reflex stimuli and impressions. The
tions of the uterus are sluggish, but continue to a great
tent independently of the fits.

The Causes of albuminuria have been adverted to when
eating of the disorder as it occurs in pregnancy. Patho-
gical evidence tends to show that the condition of the
dney which is present closely resembles an acute attack of
ight's disease. The urine is dark-coloured from the
esence of blood corpuscles; and, examined by the microscope,
lindrical clots and cylindrical masses of epithelium from the
buli uriniferi are found. In fatal cases, the structure of
kidney is discovered to be seriously altered from the
rmal condition by the presence of diffuse inflammation
ding to degeneration of the renal structures. It is, how-
r, remarkable, as separating this form of albuminuria from
ers of similar intensity, that shortly after labour, the urine
omes normal, and in a few days, or at most weeks, all
es of albumen and of renal disease disappear. It is re-
kable that in some women, the albuminuria reappears in
essive pregnancies.

e attack of convulsions is generally preceded by im-
ct vision, sometimes amounting to total blindness, tin-
aurium, irregular action of the heart, intense cephalalgia,
onfusion of intellect. The phenomena of the convul-
themselves consist of spasmodic jerking movements of
voluntary muscles, attended by complete insensibility.
s trismus with protrusion of the tongue, so that this
frequently bitten. Laryngismus and spasmodic con-
of the muscles of respiration, exist to such an extent
irely suspend respiration for some seconds at a time,
etimes cause death from asphyxia. There is great
n of the neck, face, and brain, with strong pulsation
rotids and lividity of the surface. The pulse is
frequent, at others slow. After the fit passes
is a state of torpor, and then consciousness,
s complete, generally returns after the first fits.
st cases there is no return of consciousness,
fits increase in number, the state of torpor or

valence of this disorder, and seek to apply them to the universal explanation of cases in which contagiousness appears most manifest. It is natural, observes Dr. Farr, for any man to shrink with horror from the supposition that he has communicated so fatal a disease to his patients, and to be disposed to receive any other explanation than that which refers it to contagion. Nevertheless, the interests of truth and humanity demand that the evidence of the contagiousness of puerperal fever should be put prominently forward.

The following are examples of the kind of evidence which exists in proof of the contagiousness of puerperal fever, and it may be unnecessary to state that facts of a similar kind to those here advanced might be multiplied to almost any extent.

A practitioner, for instance, had been attending cases of typhus fever. Within the space of four days he delivered five women. All these women were attacked with puerperal fever, and all of them died. This was in a country practice, and the cases were remote from each other. Different practices intersected the practice of this medical man at various points, but no other cases were known to have occurred in the neighbourhood. Again, a patient suffering from typhus fever was admitted into a lying-in hospital, where she remained for a few hours only. In the beds on the right hand and the left of this patient were two lying-in women; both were attacked almost immediately with puerperal fever, and both died. In another instance a medical man was in constant attendance upon a patient suffering from gangrenous erysipelas, and between the 8th of January and the 22nd of March attended the labours of ten women; all had puerperal fever, and eight of the patients died. This was in a town of moderate size, and no other patients in the place were known to have had puerperal fever. In another recorded instance, two medical men, brothers and partners, attended in the space of five months twenty cases of midwifery. Of these, fourteen were affected with puerperal fever, a fatal result ensuing in eight cases. The only other known death from puerperal fever, in the same town, within the period named, occurred in the case of a patient attended by a medical man who had assisted at the post-mortem of one of these puerperal patients. After this disastrous period, the two brothers relinquished all their midwifery engagements for one month, in which time five of their cases were attended by same city or district, in the practice of different medical men. It is also insisted upon that in some cases lying-in women have been exposed to the influence of surgical fever, or have been present in wards containing patients ill of peritonitis, without contracting puerperal fever. The very intensity of the contagious principle has been used as an argument against the existence of contagion. It has been said, How could any poison cling to an accoucheur for several weeks, as in those instances where medical men meeting with puerperal cases have relinquished practice for awhile, but on returning have brought the disease back with them? Great stress has been laid upon personal experience, as in the case of Dr. Meigs, who describes himself as having attended as the consulting physician upon numerous cases in an outbreak of the disease which occurred to another practitioner, but Dr. Meigs himself never took the disease to any of his own patients. It appears to me that these difficulties are much more easy of explanation than the difficulties attending those cases in which contagion seems to be most convincingly proved. Some persons may be more liable to convey infection than others, just as one individual is more prone to infection than another. At certain times, from reasons which we cannot understand, but which we know must exist, the human organism is in such a state that exposure to infection and contagion does not affect it. Nothing is more unphilosophical or unsound than in such a matter to base an opinion on personal experience, when that is opposed to general and almost universal experience. For a man to argue that because he has not conveyed contagion to his patients, contagion does not exist, is scarcely more reasonable than it would be for a soldier who has passed through a battle without a wound, to conclude that there was no danger in war. But perhaps one of the strongest arguments in favour of infection or contagion is drawn from the preventive treatment of the disease. All the greatest reductions in the mortality from this disease have arisen from measures calculated to remove infection and contagion. In the course of a few years the mortality in the great hospital of Vienna was reduced from 1 in 10 to 1 in 74 of the mothers delivered, by the precautions taken to prevent the inoculation and infection of lying-in women. In this country the disease is much less formidable than it formerly was—a circumstance which I believe to be greatly owing to the care taken in preventing the spread of the disease by contagion and infection.

It is further necessary to insist upon the fact, that the contagious principle in the case of puerperal fever, is not limited to the transmission of puerperal fever, nor to the communication of infection from one puerperal patient to another, either directly to the lying-in woman or by attendants or nurses, but that it may be conveyed in the shape of several other Animal Poisons. One of the most remarkable points connected with the puerperal poison is the fact, that, setting aside its sporadic and epidemic appearances, it may, in the first instance, originate from a variety of causes external to the patient herself. When once produced in this manner, in single cases, it may be propagated amongst puerperal women by infection and contagion. The exposure of puerperal patients to the influence of Hospital Gangrene will produce the disease. Medical men in attendance upon cases of Erysipelas have given their patients puerperal fever. It has been made out very conclusively by Semelweiss and others, that the miasms derived from the Dissecting-room will excite puerperal disease. Exposure of the puerperal woman to the poison of Scarlatina will give rise to puerperal disease in patients proof against the reception of scarlet fever itself. The mortality amongst child-bed women seized with Small-pox is well known, and such patients die with the symptoms of puerperal disease, in addition to the variola. With respect to the disorders named, and probably others also, such as putrid sore-throat and sloughs or abscesses, some law evidently exists by which they may all be respectively converted into the puerperal poison. The facts seem to warrant a belief in the UNITY of the Zymotic influence which produces all these various disorders.

An extraordinary circumstance connected with the poison of puerperal fever is, that it may be communicated in other forms to the nurses, or attendants, and even to males. The husbands of puerperal women may be attacked by sore-throat, erysipelas, or typhus fever. Within the last few years an accomplished physician-accoucheur of this metropolis was cut off suddenly by putrid fever, after examining a woman suffering from puerperal disease. In some of those cases where the same medical man has lost numerous cases in succession, as many men, women, and children have died from fever or erysipelas, as those who have perished from the puerperal disease. Thus, we have evidence that erysipelas, gangrene, fever, &c., in males, or unimpregnated women, may produce child-bed fever, and we have the converse proof that this feve may excite other dangerous disorders, as the result of contagion, in non-puerperal persons.

How is this subtle poison conveyed from person to person? In what media of communication can it lurk? Through what channels can it reach the puerperal woman? The clothes, hair, and touch of the person exposed to the poisonous influence have been supposed to be the chief means of infection and contagion; but very remarkable cases are on record, such, for instance, as when the accoucheur has shaved his head, changed the whole of his clothes, cleaned himself by hot baths and vapour baths, and soaked his hands in disinfecting solutions, and yet he has taken the malady about with him. I believe that in such cases the Blood of the person acting as the medium of infection is affected, and that by the breath, a certain halitus or infectious influence is given out, which acts upon the blood of the puerperal woman through her own lungs, and thus conveys to her system the germs of the disease. As this point possesses a practical bearing of some importance, I desire in this place to make a few observations which may explain the position I have assumed.

If we attend a post-mortem when the smell is peculiar, if we spend some time in a lying-in room where the odour of the lochia is very strong, or if we go into any very powerful smell, the taint evidently enters the body by means of the lungs, and can readily be perceived by the taste or smell, or its odour can be distinctly recognised in the saliva, in eructations from the stomach, or in the urinary, cutaneous, and other secretions. Although the party thus affected may not have been exposed to the miasma or smell but for a short time, his blood gives evidence of infection for many hours, and in some cases for several days afterwards. Some habits are more prone to receive and retain this kind of infection than others. It remains so long in certain cases, that the odour would seem to have a power of sustentation or reproduction, otherwise it is difficult to suppose that an odour to which the lungs have been exposed, it may be for a few minutes, can infect the blood and all the secretions for twenty-four or forty-eight hours. If we can trace in this way the influence of a bad odour, surely we may admit that the same thing may happen with reference to the wonderfully subtle poison or miasm in puerperal fever, or those influences which appear to be identical with the puerperal poison, and manifest similar results in the lying-in woman. I believe that the blood to this disease than patients collected together in hospitals, even when the greatest care as regards cleanliness and ventilation is observed. All lying-in women should, as far as possible, be removed from the neighbourhood of any contagious epidemic or infectious disease. It should be a rule of the practical accoucheur to have as little as possible to do with any of the animal poisons which give rise to puerperal fever. He should avoid autopsies, especially in cases of death from child-bed fever, or ordinary inflammation. The student should not attend midwifery cases while he is dissecting. After an attendance upon any suspicious case, the practitioner should change his clothes, or have them hung up in a room exposed to the fumes of chlorine. I have no doubt it would be useful for him to inhale the diluted fumes of chlorine several times a day, and after touching anything connected with any source of danger, to rinse his hands in a solution of chloride of lime or chloride of zinc. It is impossible to be too scrupulous, in a matter of such moment, and I have known some careful accoucheurs who, on entering a lying-in room, habitually wash their hands before making an examination.

In the preceding observations I have stated briefly the evidence and facts which favour the view that all the different forms and manifestations of puerperal fever depend on a specific poison, arising, in some instances, sporadically; in others prevailing epidemically; sometimes due to the zymotic influence present in erysipelas, typhus, gangrene, surgical fever, and some other diseases; communicable from patient to patient by the attendants; and whose earliest known effect is a disordered state of the blood of the childbed woman. I now proceed to describe the different secondary disorders traceable to the puerperal poison.

In the Adynamic form of puerperal fever, the effects of the poison are seen in their most terrible and virulent form. This type of the puerperal disease has prevailed in the most ravaging epidemics, and also in those outbreaks in which the contagious spread of the disorder has been most demonstrable. Occasionally, patients have been struck by the disease in the latter part of gestation, during the course of labour, or within a few hours after parturition. In other cases, two or three days have elapsed from the time of parturition before the invasion of the disease. In the worst cases, patients become at once delirious or lethargic, the pulse being very rapid, from 120 to 140 in the minute, and feeble. Sometimes acute pain is com-patient is harassed by frequent dejections and vomiting. The lochia are commonly but not invariably suppressed. More frequently, the breasts become flaccid, and without secretion; but this is not always the case. The pain is often intermittent, even in cases where it is most severe, sometimes giving the attendants and the medical practitioner the hope that it may be of the nature of after-pain. In some of these cases the mind is remarkably clear, until towards the termination of the disorder. One of the most constant and distressing symptoms is tympanites. This comes on very rapidly, in severe and acute cases, and soon rises to such a height as to interfere with the action of the diaphragm and heart. The patient may, in a few hours, become larger than she was before delivery. Considerable quantities of flatus may be discharged, but no diminution of size is perceptible, the distension appearing to depend on an immense secretion of air by the mucous membrane, with paralysis of the muscular coat. In the course of the disease, obscure symptoms of uterine inflammation, with enlargement of the organ, or of peritonitis, pleuritis, or pneumonia, are met with. When the disease proceeds to a fatal termination, the patient succumbs to exhaustion, the action of the heart becoming more frequent and feeble, congestion of the lungs, or effusion into the pleural or pericardial cavities taking place, and low delirium or coma is present for some time before dissolution. In the rare cases which terminate favourably, the sweating, purging, or diuresis, appears to relieve the patient, and she slowly recovers from a state of great debility, remaining long afterwards in a condition of extreme weakness both of mind and body. In comparatively few cases, the chief symptoms of the disease are gastric, bilious, and enteritic irritation, but these are amongst the more favourable forms of puerperal disease.

The morbid changes met with after death are very various. In the most rapidly fatal cases nothing has been met with beyond non-coagulability, thinness, and blackness of the blood. The blood in these cases resembles that of persons killed by lightning or hydrocyanic acid. There may be no signs whatever of any local inflammation, or disease of the uterus or other organs. In the less virulent and more protracted cases, purulent infection of the blood has been detected, and pus has been found in the veins and other structures of the uterus. Congestion of the lungs, gangrenous

abscess as in these organs, or effusions of mixed pus,
lymph into the pleuræ, have been observed. In
spots of ulceration in the stomach and intestines,
collections in the liver and kidneys, are recorded.
in the omentum have been frequently found, so ha
of sanious pus and feebly organized lymph in th
cavity, particularly about the uterus and its
The internal surface of the uterus and the muscul
have been found softened and in a state approach
grene, particularly in the posterior part of the org

It has been mentioned that sporadic cases of pu
ease are sometimes caused by the absorption of san
discharges, or the decomposition of coagula or por
tained placenta within the uterus. There is also a
in which sporadic puerperal fever may occur. Th
peculiarity about the state of constitution which
pregnancy and parturition, tending to assimilate
other affections to the puerperal type. It may b
in the case of a healthy pregnant woman attacked
pox or scarlatina, before abortion or premature la
duced, the disease begins to assume the puerperal
any other time than after parturition, the presen
matter in the uterus does not generally excite any
stitutional disturbance, as witnessed in the case
removed by ligature. Even inflammation of the o
excited by a difficult labour, sloughing of the vagi
ternal parts, the inflammation of fibrous tumour,
nitis, caused in the first instance by the violent c
of the uterus, has a tendency in some depraved sta
stitution to run into puerperal fever. After the
section, the patient suffers from an almost exact
puerperal fever. Dr. Simpson very ably draws a
between puerperal and surgical inflammations and
refers this similarity to the resemblance which exis
the uterus after labour and a wound after the surg
tion. No doubt this is true to a great extent, par
regards the occurrence of phlebitis. But there
pregnant and parturient woman a state of constitu
predisposes her to the formation of some virus
capable of producing the puerperal type even befo
or even before the commencement of labour. This i
the case after mechanical injuries of the gravid ute
also observed, in cases of peritonitis, pleuritis, or

visceral inflammation occurring during pregnancy. Before the uterus has been excited to expel its contents, there is an approach to the peculiar puerperal type of disease. If a gravid woman be attacked with erysipelas, she may suffer from the symptoms of puerperal fever or inflammation before the birth of the child, and the infant may, when born, be affected with erysipelas, and die within a few hours after birth. Thus, then, it seems capable of demonstration that, apart from the state of the internal surface of the uterus after parturition, and especially that part of it from which the placenta has been separated, there is in the habit and constitution of the gravid woman, some peculiarity which, under numerous circumstances, produces the virus or poison which gives their chief characteristics to the multiform varieties of puerperal inflammatory and febrile disease. Amongst the predisposing causes of puerperal fever in any of its forms, anxiety of mind and depressing emotions during pregnancy, or at the time of labour, hold a very prominent place. This is strongly insisted on by Dr. Fleetwood Churchill and many other writers. Undoubtedly this cause is a main agent in the production of some of the sporadic cases of this disease. Dr. Churchill observes, "Several of the worst cases I have seen were mainly attributable to this cause."

In many cases of puerperal fever, Peritonitis of a more or less acute form constitutes the chief part of the disease. In many epidemic outbreaks, inflammation of the peritoneum has been so constant as to give rise to the opinion that peritonitis formed the essence of puerperal fever, and puerperal peritonitis and puerperal fever came to be used as almost synonymous terms. This was very much the state of medical opinion up to the time when Guthrie, Bouillard, and Dr. Davis initiated the doctrine of phlebitis and purulent infection of the blood, so ably and laboriously worked out by Dr. Lee and others. Recent outbreaks of the disease have not manifested the peritonitic type so strongly as previous epidemics, but cases not unfrequently occur, in which the peritoneal disorder is the chief local manifestation of disease.

In Puerperal Peritonitis, or puerperal fever with peritoneal inflammation, the disease usually commences within two or three days after parturition, and seldom later than a week after labour. As previously mentioned, cases are on record, in which it has commenced before the beginning of labour, or during the course of parturition. I have referred to the all, below the natural standard. The state of the tongue is variable—sometimes red at the edges, with a white streak in the centre, at others coated or red, and sometimes without much decided alteration from the natural state. When the general tissues of the uterus are involved, this organ is swollen, and can be felt distinctly and painfully, until the rising tympanitis disguises it. There are cases in which the uterus attains a very large size, after having contracted subsequent to labour. The tympanitic distension which ensues is often very great, and the swelling of the abdomen is sometimes further increased by effusion of sero-pus into the cavity of the peritoneum, when the surface acquires a peculiar doughy or boggy feel. Sickness is very constantly present in this disease, and adds greatly to the suffering of the patient, from the compression of the abdomen by the efforts at vomiting. Dysuria is complained of, and the urine is scanty and high coloured. As the disease progresses, purging commonly supervenes, the motions becoming dark and offensive towards the last. Throughout, the breathing is short and painful, and cephalalgia is often present. Beyond this, the brain is frequently unaffected until the close of the disease approaches. The physiognomy is from the first distressing and pinched, so as to be almost of itself characteristic of the disease. No one who has ever seen the disease can mistake the indications afforded by the countenance and the pulse. The dark areola surrounding the eyes, the dilated pupil, the glassy surface and bloodless conjunctiva, give a lustrous and unearthly appearance to the eyes in most cases of puerperal fever, whatever the special complication, when the disease is fully formed. Occasionally, in this disease, there is an appearance of the sudden transference of disease to the pleura, and, more rarely, to the serous membranes of the brain. When the peritoneal inflammation is chiefly limited to the uterus and its appendages, the symptoms are somewhat less severe, and the pain more local, than in general peritonitis, being felt most distinctly in the iliac regions, and sometimes on one side only. With the local peritonitis, there is frequently inflammation of the broad ligaments, the sub-peritoneal cellular tissue, the Fallopian tubes, and the ovaria. Suppuration and abscesses sometimes form in these structures, and in the most favourable cases either burst spontaneously on the surface of the lower part of the abdomen or into the vagina or rectum, or they sometimes admit of puncture and artificial evacuation.

necessary to the production of pyæmia. Recently, the researches of Virchow have tended to show that all the phenomena of phlebitis depend on the formation of coagula in the veins, and the transformation of these coagula into pus and other elements.

Uterine phlebitis generally commences on the second, third, or fourth day after labour, with shivering or rigor, and a marked increase in the quickness of the pulse, which ranges throughout from 110 to 140 and 150. There is usually pain in the hypogastric, or one of the iliac regions, the pain becoming more evident upon deep pressure. There is also pain in the back, or in one or both hips, extending downwards to the thighs. The pain is generally intermittent, and is sometimes absent for many hours. The patient is usually anxious to be quiet, every movement of the body greatly increasing the pain, when this symptom is present. But in a considerable number of cases the pain alone is not so marked as to indicate the dangerous state of the patient, and in some instances it is absent altogether. The lochia may become offensive at the commencement of the disorder; they may be scanty, or they may remain in normal quantity and quality. The mammary secretion is usually suspended; but in some cases it continues until the patient is exhausted by the progress of the disease. The perspiration is very distressing and constant, and after three or four days from the commencement of the attack, diarrhœa is generally present. At intervals, throughout the course of the disease, violent rigors are felt, which may be supposed to mark successive formations of pus, or the commencement of inflammation in other organs beside the uterus. The state of the tongue is very variable, and it may be red and glazed, or covered by a creamy fur, or scarcely altered from the natural state. The complexion of the patient is at first little altered, except by the presence of a hectic spot on each cheek. The mind is clear, but the speech and movements of the patient are tremulous. The patient often sleeps tolerably well, and frequently expresses herself as feeling better; but her manner is anxious and trembling, thanking those about her so nervously for the slightest attention, that her state in this respect has often been compared to the incipient stage of puerperal mania. The tympanitic distension of the abdomen is not the least distressing symptom, giving rise to hiccup, vomiting, and greatly interfering with the respiration and the action of the heart.

As the disease progresses, th
uterine phlebitis and the format
become evident. The patient c
joint or joints; swellings appear i
articulations, and erysipelatous bl
different parts of the body. The
elbows are the joints most comn
purations in the vicinity of the
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blushes. Sometimes the seconda
eye, especially the left, leading t
cornea. These external suppuratio
hausting, may be considered some
and as giving some faint hopes
point, up to the time, in fact, v
begins, it is acknowledged by
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existence of phlebitis. This is
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cations are more dangerous tha
abscesses. These phenomena ca
pyæmia, of which they are the res
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flammatory symptoms subside to
adynamic or typhoid symptoms f
selves. It is necessary, however, t
low state of system thus produced
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peral virus is very potent, and b
suppuration has progressed in th
recover, they slowly struggle thro
duced by the extensive suppuration
with anchylosed joints, to bear wit
through which they have passed.
the patient dies with symptoms v
scribed when speaking of the ady
fever, or exhausted by the discharg
ternal suppurations.

The tendency of the puerperal ar
to attack the joints, is a very rema

fection. Large effusions of pus and sero-purulent fluid are poured out in the joints affected, and the cartilages are often eroded and destroyed to a remarkable extent. No explanation has hitherto been given of the reasons why the joints, the eyes, or the serous membranes should be especially selected. I would suggest the probability, that this selection may depend on the nourishment of parts of the eye, cartilages, and serous membranes, by the non-vascular permeation of the tissues by the liquor sanguinis, as explained by the researches of Mr. Toynbee. The diseased liquor sanguinis, or in purulent infection of the blood, the liquor puris, may easily be supposed to affect especially those tissues of the body in which special provisions exist for their permeation by the colourless parts of the blood. One of the earliest, as well as one of the most graphic descriptions of puerperal affections of the joints we owe to Mr. Coulson, who has described the careful dissection of numerous cases of this kind.

Besides uterine phlebitis, other forms of puerperal inflammation of the uterus occur. That which affects the Lymphatic vessels does not materially differ in symptoms, progress, and termination from phlebitis. Inflammation of the Muscular tissue and lining membrane of the uterus is characterized by great disturbance of the nervous system, distressing cephalalgia; and is attended by fever of low type. Occasionally the cerebral symptoms are so intense as to entirely mask the uterine disease. It is ushered in by the same symptoms as regards rigors, acceleration of the pulse, and state of tongue as those which attend the other varieties of puerperal inflammation. Its tendency is to produce softening, suppuration, and gangrene of the substance of the uterus, and it is one of the most fatal of all the puerperal inflammations.

Before speaking of the Treatment of Puerperal Fever in its varied forms, it cannot be too much insisted on that it is a disease, almost above all others, open to *Prevention* rather than *Cure*. The avoidance of injuries of the uterus or vagina in difficult or instrumental labours, the entire removal of the placenta, and the promotion of a free lochial discharge, with the avoidance of the possibility of inoculating or infecting the puerperal woman with any of the poisons which admit of conversion into the puerperal poison, are of the greatest importance in preventing the appearance or extension of this terrible disease. As regards the actual treatment, nothing

CHAPTER XLII.

PHLEGMASIA DOLENS—PUERPERAL ARTERITIS—S
IN THE PUERPERAL STATE.

Phlegmasia Dolens, though generally a di
puerperal state, is not limited to this period.
occurs during the course of pregnancy, or towar
lactation. It may also happen independen
bearing, in dysmenorrhœal patients; in women
carcinoma, or the subjects of metritis; or after
of tying a polypus. In still more rare cases,
met with in the male subject, as the result of
irritation.

Pathological researches show that the disea
depends on Obstruction of the Veins of the low
This is proved by the dissections of Dr. D. Da
M. Bouillard, Virchow, and numerous other
The veins affected are, the crural, iliac, uterine
saphena, and sometimes the vena cava. The o
some cases, consists of fibrinous coagula, and
coagulated lymph, or pus. The whole of the
and frequently the vulva, is, as the disease prog
with serous effusion, and in some cases the lym
and nerves of the extremity show the existence of
in their structures.

The mode in which the obstruction of the v
is not at the present time a settled matter. Dr.
it to depend on inflammation, extending from t
the iliac and crural veins. But cases are met
the obstruction is limited to the veins in the low
leg, or in which it appears in the upper extr
out symptoms of local uterine phlebitis. The
doctrine—that founded by Virchow upon his nun
tions—is that the first pathological condition c
formation of a coagulum in the vein; and that the
of the vein, effusion of lymph and pus, and the b
of the coagulum and formation of pus in its
phenomena which result from the plugging of
appears, however, that the evidence of the exte

question. Some authorities have strongly recommended early bleeding, and others have opposed it, advocating a tonic regimen, and directing all their efforts to the preservation of as healthy a state of the blood as possible. In one instance, in this metropolis, bleeding was tried on a large scale in a lying-in hospital, where venesection was performed on the very first approach of the disease, and the mortality was greater than when an opposite plan was adopted. In the present state of our experience in this disease, bleeding appears to be called for at its commencement, when the pain is acute and the pulse rapid. But this disease is often so insidious, and its progress attended by such remissions, that it is difficult, if not impossible, to decide on bleeding until distinct evidences of pyæmia have appeared, when bleeding becomes injurious rather than otherwise. As soon as this becomes evident, cinchona, nitric acid, chlorate of potash, ether, ammonia, strong animal broths, wine, and brandy, are agreed upon by all authorities as the best line of treatment. Whenever, within my experience, a recovery has taken place from a bad attack of puerperal fever, especially when phlebitis has existed, a very free and continuous administration of wine and brandy has been the line of practice followed. It appears as though the filling of the vessels with alcohol will do more to neutralize the poison of puerperal fever than any other remedy. Pain must be allayed by opiates, and the painful joints bathed with opiate embrocations or a chloroform liniment. When collections of matter are evident upon the surface, they should be opened, and it is believed that the external discharge of pus adds somewhat to the chance of recovery. Congestion of the lungs or brain must be met by sinapisms or blisters, and the meteorismus relieved, as far as possible, by carminatives, turpentine enemata, or the introduction of a tube into the intestinal canal. It is impossible to do more than lay down general principles, and indicate the points of treatment, within the scope of a work like the present. A patient suffering from the disease now under consideration will tax all the resources and all the vigilance of the most able and painstaking practitioner.

first felt in the ankle, knee, groin, or hips
the part first complained of is red, but it
pale. Within twenty-four hours from t
the part affected generally swells and beco
and shining. It generally pits on pressure,
beginning. When the swelling commence
hips, it commonly extends downwards, but,
first part affected, the swelling ascends, so t
the whole limb usually becomes affected.
however, limited to the parts below the kn
vein is always, when the disease involves the
and painful, and rolls under the finger.
intense in the course of the inflamed and o
Sometimes the track of the vein is marked
but in other cases, the colour of the skin
When the lower part of the limb is the chief
the inflamed and indurated vessels are found
space and on the inner side of the leg and
phatics, as well as the veins, are sometimes
inguinal glands are in such cases swollen a
limb becomes of large size from effusion
tissue, and at the height of the disease, the
as not to admit of pitting on pressure. T
symptoms are severe. The pulse is from
tongue generally glazed, the stomach irritabl
is distressed by profuse sweating. The debil
and the pain often prevents sleep almost e
week or ten days, or a longer period, a
severity of the attack, the disease begins t
pain becomes less acute, the tension of the l
and the effusion slowly disappears. In other
occurs in certain parts, or over the entire li
the inguinal and femoral glands, or the v
abscesses occur in the cellular tissue, or the
joints inflame and suppurate. Generally the
limb affected, but in a certain proportion of
appears in the right leg as soon as it begins t
left, and in very rare instances a transferen
upper extremities. Even in the most favour
some time before the limb or limbs affecte
natural size, or acquire their usual strength a
tenderness, and it is remarkable that pati
suffered from this malady are more liable t

tion or inflammation from the uterus to the veins, in many cases, cannot be rejected. This inflammation of the internal coat of the vein appears to cause coagulation of the blood circulating within the vessels. In other cases, the presence of vitiated blood in the veins seems to cause coagulation and plugging, without the intervention of inflammation. When a firm plug is formed from any cause, patients go through the phenomena of pure phlegmasia dolens. When it is loose, or breaks off, the circulation generally becomes vitiated, and other symptoms besides those of phlegmasia dolens are manifested.

The inflammation of the lymphatics and nerves occasionally met with is probably of a secondary nature, and dependent on the profuse infiltration of the tissue of the limb with serum of a highly acrid and irritating character. The whole subject is one, however, in which pathological investigations are not as yet definitely agreed.

The affinity between phlegmasia dolens and ordinary puerperal phlebitis and fever are strongly marked. In some cases of phlegmasia dolens, the inflammation is not limited to the veins of the lower extremities, and suppuration occurs in other parts of the body, and in the eyes, as in ordinary puerperal phlebitis. In other cases, inflammations of the serous membranes, as the pleura or peritoneum, are found in combination with the inflammation of the crural vessels, and the patients die of precisely the same symptoms as those met with in ordinary puerperal phlebitis, or puerperal fever. I have also seen cases which tend strongly to prove that phlegmasia dolens may be produced as the result of infection. For instance, a short time ago, a friend of mine had been in close attendance upon a patient dying of erysipelatous sore-throat with sloughing, and was himself affected with sore-throat. Under these circumstances he attended, within the space of twenty-four hours, three ladies in their confinements, all of whom were attacked with phlegmasia dolens.

The common period for the invasion of the disease is between the end of the first and third week after parturition. For a day or two before the presence of any local symptoms in the extremities, there is great depression, restlessness, irritability, and fever, with or without pain in the uterine region. During this time there is frequently chilliness, or a distinct rigor. The first pain in the leg is usually in the calf, and is very intense and distressing; sometimes the pain is

place for an antiphlogistic treatment. P
beef-tea, soup, broths, milk, arrowroot
cording as the stomach will bear them, a
of wine or brandy. Quinine or bark,
chlorate of potash or the mineral acids,
time be given. Much care is required
ment of the painful parts of the limb.
should be defended by a cradle from th
clothes. Sometimes the greatest comf
wrapping the whole limb in a linseed p
local pain is intense, great relief is affor
extract of belladonna, mixed with a little
putting it on the painful part as a plaste
is not broken, equal parts of chloroform
sometimes allay pain. When vesications
dredging the limb with flour, should be
as to ascertain which is most suitable to
Abscesses require to be treated as in other
In cases where resolution occurs, the di
swelling may be favoured by a flannel band
of an iodine liniment or ointment, or a
curial liniment. Frequent frictions of t
persevered in. Change of air, and sea-bat
the year suits, tend greatly to aid recovery

The subjects of Arterial Obstruction
curring in connexion with childbearing an
ditions, have only recently been investigate
explain some very curious phenomena wh
been observed without being understoo
contributions to our knowledge of this
made by Dr. Kirkes, Prof. Simpson, Dr. L
Dr. R. Virchow, and others. Under a
stances solid matters may pass into the c
come arrested at various points, according
morbid material, and the vessels in which
cases of rheumatic or other disease of th
vegetations or excrescences have formed upo
bodies may be detached from their habitats
gles of labour, or in the accelerated circu
gestation, or the puerperal state, or during
formed in the cavities of the heart may also
the pulmonary arteries or the aorta. In
the blood, and in arteritis, or laceration of

disease, after subsequent labours. In the worst cases, death may occur suddenly, or as the result of exhaustion during the progress of the disease, and the patient may be worn out by diarrhœa or by the suppurations which occur in the joints or in other parts of the affected limb. When diffuse phlebitis occurs, in combination with phlegmasia dolens, or when metritis or inflammation of the serous membranes of the pleura or peritoneum accompanies it, the course of the disease and its dangers are little different from the other forms of puerperal fever.

As regards the Causes of the disease, it appears, apart from the influences of contagion or infection, to be brought on by early exertion after parturition, by exposure to cold, and by unusually severe after-pains. I believe, however, that contagion and infection play a very important part in the production of the disease. I look on a woman attacked with phlegmasia dolens as having made a fortunate escape from the greater dangers of diffuse phlebitis or puerperal fever. The plug formed in the vein is generally effective in cutting off the affected extremity from the rest of the circulation, and is so far sanative in its influence. Multiparous women appear to be more prone to the disease than primipara.

In the treatment of Phlegmasia Dolens, it is necessary, at the onset of the disease, to apply leeches freely over the course of the inflamed vein. This should be followed by poultices to encourage the bleeding, and warm fomentations, which generally relieve the pain more than cold applications. If necessary, the leeches should be repeated a second or even a third time, but general bloodletting will rarely be required. Some practitioners prefer blisters to leeches, and in the milder cases of the disease, they are frequently efficacious. They should be applied over the seat of pain or the inflamed vessel. The bowels should be relieved by mercurial purgatives, and the administration of mercury so as to affect the mouth is often useful in the beginning of the disorder. Opiates require to be given freely to obtain relief from pain and to procure sleep. They are necessary at the commencement of the disease, when the vein is acutely inflamed and painful; and subsequently, when the tension of the limb from effusion is at its height, or when local suppurations occur. After the first inflammatory invasion, there soon comes a time when the weakness and depression is so great, that there is no

The consideration of the causes of Sudd
in the puerperal state is included in th
because some of the most marked cases o
on cardiac, venous, or arterial obstruction,
and arteritis. In some cases of sudden d
with gestation, childbirth, or lactation, but
the puerperal period, the only post-mortem
presence of firm coagula in the cavities
pointed out by Dr. Meigs. Others depend
result of obstruction of the carotids, or th
In some cases, obstruction of the pulmona
have depended on the transfer of coagula fr
caused sudden dissolution. This was appar
the case of the lamented Duchess de Nem
by the careful autopsy performed by Dr. G
The death in these cases generally occurs du
emotion, or upon slight exertion. In the c
coagula formed in the heart itself during lif
generally appears to have occurred during f

Another cause of sudden death after labo
presence of air in the veins. This subject
elucidated by the researches of Drs. Cormack
and others, and appears to explain some
accidents met with after labour. Numerou
death are on record in which, upon post-mor
no other cause of death than the presence o
could be made out. Such cases are also ill
instances in which death has been caused
air into the veins of the neck, during opera
of the body. In both classes of cases th
been found to be closely identical. The m
accident in the puerperal state seems to be
occurrence of physometra in the ungravid u
uterus after delivery, have frequently been
labour, it may be caused by the secretion
uterine cavity, or by the decomposition of intr
such as coagula or a dead child. If in su
does not escape from the os uteri, but is
uterus, the mechanical arrangements of t
favour the entrance of air into the circulati
and as soon as it reaches the heart the most
are observable. All the phenomena of sud
present; but the chief diagnostic mark,

hæmorrhage from the bowels threatening death. It has been employed in chorea arising from pregnancy, and also in mania occurring during gestation; in puerperal convulsions; and it has been resorted to in cases of dropsy of the amnion, when the fluid has increased to such an extent as to seriously interfere with the circulation and respiration of the mother, or when it has excited excessive vomiting. It has been found necessary in cases of irreducible retroversion of the uterus, attended by dangerous symptoms. In any other contingency whatever, besides those named, in which danger exists, and in which the peril is materially increased by the continuance of pregnancy, the induction of premature labour is demanded; but, it should be borne in mind, that it ought not to be performed in any case before the time at which the child becomes viable, unless there is the certainty of present or future danger to the mother from the further continuance of gestation. But in the cases above mentioned, in which the life of the mother is in positive danger, or will be placed in inevitable danger, by the continuance of pregnancy up to the time at which the child becomes viable, it is held right to sacrifice the fœtus by inducing premature labour, and, as a necessary converse, wrong to neglect the performance of this operation. Many of the cases of the Cæsarian operation in which the lives of the mothers have been sacrificed, have been cases in which abortion or premature labour might have been readily induced, and the hazard of almost certain death avoided.

Some have maintained that a certain limit should be placed to the number of times in which the operation for the induction of premature labour should be performed in the same woman, in cases where pelvic deformity exists to such an extent as to render the birth of a living child *per vias naturales* impossible. It has been affirmed that women have no right to go on placing themselves in the position to require the sacrifice of many living children in succession, but that they ought rather themselves to submit to the Cæsarian section. Denman had scruples on this point, and in the present day Dr. Radford has distinguished himself for his advocacy of what is called the right of the fœtus, as opposed to that of the mother, in such cases. My own strong impression—I may say conviction—is, however, that we must deal with the woman pregnant for the twentieth time as we would in her first pregnancy, and that in all cases our clear and paramount duty is to save the woman. No doubt every right-minded version, the patient died with the ovum still *in utero*, no attempt at inducing abortion having been made.

It is an important element, in reference to the operation of inducing premature labour, to decide the age at which a fœtus becomes Viable, or in a condition to live after its expulsion from the uterus. The fœtus is not viable—that is, it cannot maintain an independent existence—until towards the end of the seventh month; and any circumstances calling for the induction of premature labour before this time must necessarily involve great risk of sacrificing the life of the ovum. Cases occur in which children, born at an earlier time than this, survive; but these are rare exceptions. Even at the seventh month they are kept alive with difficulty. The state of the heart, as regards development, the feebleness with which the fœtus sucks before this time, the ready failure of animal heat, and the inability to bear the movements necessary to cleansing and nursing, render it almost impossible to rear the fœtus born at an earlier period.

In the Second Class of cases, the induction of premature labour is called for some time between the seventh month and the end of gestation, and the operation is performed with a view to the safety of both mother and child. The chief condition under which this occurs is such an amount of pelvic distortion as would admit of the passage of a child at the end of the seventh or eighth month, but which at the full term would call for craniotomy, or, if labour were allowed to go on without assistance, would endanger the life of the mother as well as the child. Some of the morbid states already referred to, as calling, in certain cases, for delivery before the end of the seventh month, may not in others reach a dangerous extent until after the time when the child becomes viable. This is particularly the case with respect to mania, chorea, fibrous, and ovarian tumours, disease of the heart and lungs, albuminuria, convulsions, dropsy of the amnion, hæmorrhages, and other causes of dangerous debility, which may admit of waiting until after the date of the viability of the child, but if allowed to proceed after that time would place the woman in great danger in labour at the full term. In this second class of cases, it sometimes happens that either the mother or the child may be in the greatest danger of the two, but generally both parent and offspring are delivered from risk by the induction of artificial delivery.

In the Third Class of cases, the operation is called for en-to be examined, as affording data for treatment in subsequent pregnancies, and for the performance of this operation. The placenta will in these cases frequently be found the subject of fatty degeneration, or the results of inflammation, or the decidual surface will be studded with calcareous matter.

Many methods of inducing premature labour have been practised. The earliest plan adopted—that which followed the great consultation of accoucheurs, in 1756, about a century ago—was that of puncturing the membranes with a quill, sharpened at the point. Afterwards, a stilette, or a stiletted catheter, was used. The objections to this form of operation are, that by the evacuation of the waters at the commencement of labour, the chances of saving the fœtus are considerably diminished. It is also dangerous to perform it in the early months of pregnancy, particularly in primipara, owing to the undeveloped state of the os and cervix uteri, and fatal results have followed its adoption, even when performed in this way, in the latter months. The dilatation of the os uteri by tents; the separation of the membranes from the os and cervix uteri by a catheter, a large bougie, or the uterine sound; the administration of the ergot of rye—a plan preferred by Dr. Ramsbotham; the use of electricity; the application of cupping-glasses to the mammæ, as practised by Scanzoni; the distension of the vagina by a caoutchouc bag filled with air or water, as recommended by Prof. C. Braun of Vienna, and by other means. But in all these applications, a considerable time often elapses before effective uterine contractions can be excited, and in some cases the uterus refuses to obey the calls of such stimuli. I have little doubt the induction of premature labour might readily be effected by means of galvanism, and I have excited the premature expulsion of the contents of the uterus of the rabbit and guinea pig by this means, as a matter of experiment.

A method superior to all others, where the safety of the child especially is an object, is that of the water-douche, said to have been long practised in Holland, but introduced in a systematic manner into practice, and methodized, by the late Prof. Kiwisch, of Wurzburgh, a man of rare obstetric genius. If a stream of hot or cold water be directed against, or, still better, within the os uteri, at intervals of three or four hours, for the space of ten minutes or a quarter of an hour at each application, labour is certainly and speedily brought on. The water may be made, by means of a syphon and

reservoir, to descend upon the uterus fro
be passed into the os uteri by a common
or an O'Beirne's tube. Kiwisch explaine
of the douche on the supposition that it
the parts by the imbibition of fluid, an
decidua from the uterus. No doubt the
actions of the uterus are also excited, a
douche more efficacious when warm and c
injected alternately, than when either wa
applied alone. The great superiority of t
in the fact that premature expulsion, e
means, is a closer resemblance to natural
obtained in any other mode. There is n
to the os uteri, and the membranes remain
the stage of dilatation, just as in ordinar
happens that the os uteri is dilated by th
pressure, and the fœtus escapes compressi
of labour. These circumstances are attend
advantages, that in my opinion no one wo
puncturing the membranes in a case in
brought on to save the mother and the
stances where the child alone was in dange
certainly cannot be ruptured as a prelimina
of labour without diminishing the chances
The use of the douche certainly possesse
in all cases in which the safety of the chil
cases where there is no possibility of givin
child, the stiletted catheter or other means
but even then the douche promises the gre
mother, except under certain circumstance
mentioned. One great advantage of the do
premature labour may be induced in cases
in which it is impossible to reach the os ute

The length of time which may intervene
mencement of the operation and the comple
labour, is an important element in estimatin
different methods. This is particularly the
in which, for the safety of the child or the
portant that the uterus should be emptied
sible, as, for instance, in cases in which
failing, or in which the mother is in great d
peral convulsions. Under such conditions
of ergot, the puncture of the membranes,
requiring considerable time for their actio

greatest number of still births occur, and the greatest danger to both mother and child are met with. At the present day, there is no point of progress in the obstetric art of equal importance with the extension of the induction of abortion and premature labour, in cases calling for the operation.

The extension of the induction of premature labour in cases where mothers have, in successive births, produced still-born children, is in fact the great means to which we must look for the diminution of the mortality amongst children at birth. Every man engaged in the special or general practice of midwifery, must have met with cases in which healthy well-formed women have produced a considerable number of still-born children in successive births, or in which, out of large families, only one or two have survived the birth. It is to such cases that the induction of premature labour is peculiarly applicable, and in which it is at the present time but little practised. In cases of this kind, the chances of saving the child may be immensely increased by the operation, without risk to the mother. A vast amount of prejudice has, however, to be got over, before this subject will be placed on its proper footing. I saw, a year or two ago, a case with Dr. Trouncer, in which premature labour was brought on after the mother had given birth to several dead children in succession; on this occasion a live child was born, but in the next pregnancy the patient declined the operation, and another still-birth occurred. Similar instances must constantly happen. In a matter of this kind, it is only slowly that a great improvement can be carried out. It is computed, in a letter by Dr. Farr, to the Registrar-general, on the Causes of Death in England in 1854, that the proportion of still-born to live-born children is about 3 dead to every 100 born living. The total number of births in England and Wales in 1852 was computed to be 646,134. Of these, 624,012 were born alive, and 22,122 were estimated to have been still-born. In France, in the same year, the number of children still-born, or dying before the registration of birth, was 68,267. This is an immense number of children, the great proportion of whom are lost during, or immediately before, the act of parturition. There can be no doubt that the number might be greatly diminished by the extension of the practice of the induction of premature delivery in proper cases. Carrying the mind from England and France, to the other countries of the civilized world, the mass of infant life, to the saving of which obstetric science must address itself

The Hand to be used by the op
matter worthy of consideration. Tw
first, the hand which most easily adap
conditions in which turning is requi
hand with which the operator possesses
manipulation. It is best, as far as pos
selves to the use of both hands in obst
acquire a readiness in the use of the l
right; but for persons who are awkwar
the left hand, the greater mechanical
for its introduction, in some cases, will
for the greater power and freedom poss
and arm. One thing should be espe
namely, to use, if possible, at the com
with which we shall be able to comple
not to fall upon the course of being ob
hand in order to substitute the other,
been in part performed.

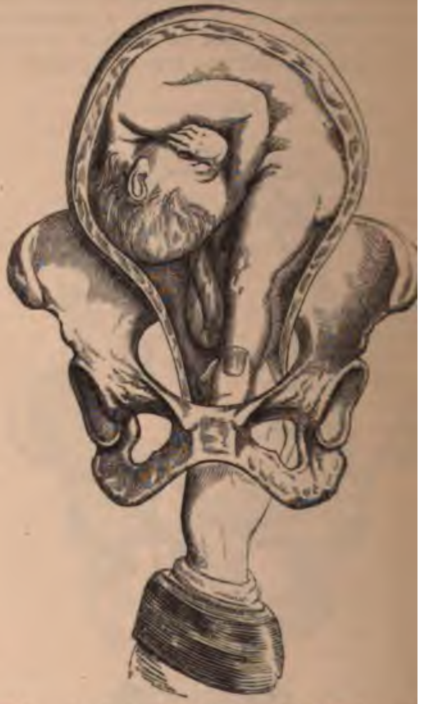
In placenta prævia, the hand to be intr
in part upon the situation of the sepa
from the os and cervix uteri, or, in cas
presentation, upon the portion of the
which the placenta is attached. When
rated from the anterior or left border
uteri, or when it is attached only to t
margin of the uterine aperture, the ri
venient. When the opposite state of thi
is, when the placenta is detached or w
on the right side of the os and cervix,
readily introduced into the uterine cavit
such cases, is to pass the hand through
detachment of the placenta as possible.
is called for by some condition of the
presents, the mechanical facilities of
reaching the feet are modified by the si
It is easier to pass the hand over the
and the feet of the child are usually f
as the face. Thus, in the first and fou
and in the second and third positions, th
most convenient. When the head is k
the special presentation cannot be made
for granted that the head presents in
presentation occurring in from 70 to 80

cases, being quite as safe for the mother. It has to be resorted to in a considerable number of circumstances in which the patient is in danger from the continuance of labour, but in which craniotomy cannot or ought not to be performed; such as hæmorrhage occurring during the course of labour, and irrepressible by rupture of the membranes or by other means; convulsions; rupture of the uterus and escape of the child into the abdomen; excessive debility; fainting; and dangerous vomiting during labour. The balance of evidence would also appear to be in favour of the performance of this operation in some cases of moderately-contracted pelvis, in which craniotomy would be required in head presentation. But the application of turning to such conditions is one of the agitated questions of the present day, which requires the sober and dispassionate consideration of all who are interested in the establishment and advance of obstetrics. In some cases of twins, in which the second child presents with the head, but where no progress is made, and where the head is too high to admit of the application of the forceps, turning becomes necessary and proper. Turning has been also recommended in cases where the mother has died during labour; but the mortality of children after turning, in such cases, is much greater than when the Cæsarian section is resorted to.

Turning is a serious operation, not only with reference to the contingencies in which it is required, and as regards the direct consequences of the procedure to the mother and child. Some of the conditions in which it is called for, as convulsions, rupture of the uterus, and placenta prævia, are themselves highly dangerous. In the performance of the operation also, uterine inflammation may be excited, the uterus may be ruptured or perforated, and the mere shock of the operation is fatal in some cases. The danger to the child arises chiefly from the compression of the funis during the passage of the thorax and head, and the extension of the neck in passing through the pelvis or the ostium vaginæ. According to the statistical researches of Dr. Fleetwood Churchill, in 419 cases in which the result to the mother was noted, 29 deaths occurred, or 1 in 14½; in 792 cases in which the result to the child is stated, 294 children were born dead, or rather more than 1 in 3. This mortality, especially as regards the mother, must, however, be divided between the operation itself, and the dangerous contingencies in which it is sometimes required.

second position, in arm cases, when the abdom child is towards the abdomen of the mother, the ri

Fig. 161.



Withdrawal of the hand, and the act of bringing down th in vertex presentation.

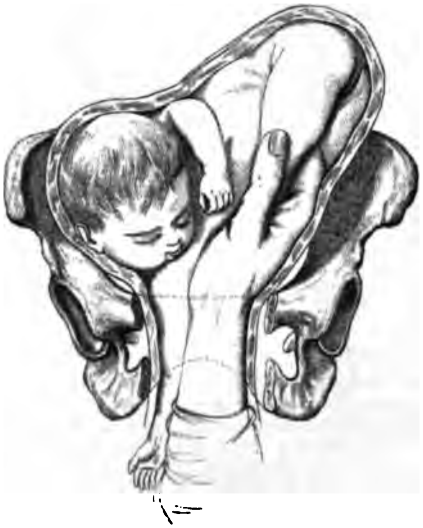
the accoucheur should be employed. Turning, whe hand can be most readily employed—that is, when th of the child and the extremities are directed to abdomen of the mother, is more easy than when abdomen is turned towards the spine, on account of the greater depth of the pelvis posteriorly as compared with the anterior, and the less distance the hand has to traverse to reach the uterus in front. In all cases of doubt, therefore, or when the facilities of passing the hand in any direction are equal, the right should be preferred, both on account of the greater ease with which it reaches the uterus, and the greater skill in manipulation possessed by almost all persons with the right hand.

As a preliminary to Turning, and to all operations within the pelvis, the bladder and the bowels should be emptied. The position of the patient varies in different schools and with different teachers. In France and America, many of the best authorities prefer to have the woman placed on her back. In this country, the ordinary obstetric position on the left side is generally preferred; but the nates are brought to the edge of the bed, and the body of the patient placed at right angles with it. The accoucheur should not only bare his arm, but take off his coat, to avoid the effect of pressure on the muscles, and having introduced some lard into the vagina, and well greased the wrist and the back of the hand which it is intended to use, the operation may be commenced. The first difficulty is at the ostium vaginæ, and the introduction of the hand into the passage is often the most painful part of the whole process. The fingers and thumb should be put together in a conoidal shape, and gently introduced during a recession between the pains, in the direction of the axis of the outlet of the pelvis. When the thickest part of the hand is passing the sphincter vaginæ, the patient, if sensible, generally cries out, and this cry facilitates the passing of the hand by relaxing the sphincter. When the hand is fairly in the vagina, and the os externum embraces the wrist, there is usually little suffering; and, at this stage of the procedure, a short pause is advisable, during which, if the head or presenting part be not very low down, the accoucheur may make a more complete examination than he could accomplish with the finger alone, and decide as to the direction in which the hand should be carried forward through the pelvis. When the arm or a shoulder presents, there is a difficulty in introducing the hand into the vagina, not only from the state of the os externum, but from the shortness of the unoccupied portion of the canal, and it requires some management to pass the hand into the vagina in such a manner as to retain act after the membranes have been ruptured, and the uterus has contracted more or less firmly upon the fœtus.

When the os uteri is only partially dilated, the passage of the hand into the uterus is a more difficult procedure. It is held that when the os is dilated to the extent of a crown-piece, or two or three fingers can be introduced, either with or without the rupture of the membranes, the hand may, with care, be passed in, so as to turn. The os must be very gently and slowly dilated by separating the fingers, and urging them on in the cone shape used in passing the ostium vaginæ, the pressure being exerted in the direction of the inlet of the pelvis. Care must be taken to support the uterus externally, and not to push the uterus upwards to such an extent as to separate it from the vagina. When the os has been fairly passed by the hand, the anterior surface of the fœtus must be reached in the way already described.

Among the most difficult cases of turning are those of transverse presentation in which the diagnosis has not been made out early in labour, or in which the case, from some circumstance or other, has gone on for a long time unrelieved. Here, the arm or shoulder is found low down in the pelvis, occupying the vagina; the presenting part is firmly embraced or grasped by the os uteri; the waters have long flowed away; the uterus has closed with great energy upon the fœtus, and is reduced to the smallest possible compass consistent with the retention of the placenta and the non-presenting portions of the fœtus. Thus every step of the operation becomes perplexing. It is difficult to introduce the hand into the vagina, and still more so to pass the hand, or part of the hand, into the uterus and raise the presenting parts of the child. It is only by slow degrees that the difficulties can be surmounted so far as to allow the lower extremities of the child to be reached. There are, however, some circumstances which, to a certain extent, counterbalance these unfavourable conditions. In transverse cases, the shape of the uterus is considerably modified. Its greatest diameter is the transverse instead of the perpendicular, and consequently the lower extremities of the child are much nearer the os uteri than in vertex cases, or in arm cases where the waters have not escaped. It is often therefore unnecessary, and indeed impossible, to pass the hand far into the uterus, and frequently a foot or arm can be brought down by the introduction of one or two fingers only within the os uteri, the bulk of the hand ıes to be exerted on the umbilical cord. With this view, foot, rather than two, should be brought down. We have ı that in cases where the breech presents, the mortality is ı 3½, while in cases in which the feet present, the mortality in 2½. In bringing down one foot, we assimilate the case ɔreech presentation. In a case in which one foot is brought m, and the other extremity remains flexed upon the omen, the circumference of the presenting part is from 11 12½ inches; when both feet come down, the circumference he breech is from 10 to 11¼ inches. It is therefore safer ɔring down one foot in turning when the operation is per-ned with reference to the fœtus, as the greater dilatation he soft parts by the pelvic portion of the child favours the cent of the head and the defence of the umbilical cord n pressure. When it can be reached before the foot, there

FIG. 162.



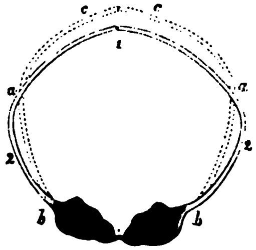
Turning in transverse presentation, in the abdomino-anterior position, with the right hand.

presentations of these parts were under consideration. In the case of turning on account of pelvic deformity, the object being to bring the head through the pelvis as quickly as is consistent with the safety of the child, both feet should be brought down if possible. When one foot is perceived, and can be brought through the os externum, a tape or handkerchief should be put round it to enable the accoucheur to hold it more securely. The foot is slippery, particularly if the child is covered with caseous matter, and the fœtus has a tendency to be drawn upwards on the subsidence of every pain. In delivery, the same treatment is to be adopted as that directed in knee or footling cases, only that greater or less expedition in effecting delivery must be followed according to the special exigencies of the child or the mother. The Forceps ought always to be in readiness to complete, if necessary, the delivery of the head. After all cases of turning, the patient should be carefully watched, with a view to the prevention of local inflammation.

In some rare instances of transverse presentation, it is possible to raise the arm or shoulder and bring down the head, thus effecting what is called Cephalic Version. In this operation we have to retrace the steps by which the presentation of the head is converted into transverse presentations. The head of the child has to be manipulated by the hand engaged in utero, assisted by the other hand applied externally, so as to bring it to the pelvic brim, with the vertex directed towards one of the sacro-iliac articulations. After this, the case is left to Nature. Cephalic version is very much aided by external manipulation, particularly when the uterus and abdominal walls are sufficiently thin to allow of the different parts of the fœtus being readily felt. Cases are recorded, by Martin of Jena and others, in which rectification and alteration of mal-presentations have been effected by external manipulation alone. In Pelvic Version, the nates are brought down, but this is a very difficult procedure on account of the lubricity of the parts; and it is not of very much greater value, when effected, than Podalic Version, when one foot only is brought down.

I have already referred to the question of the performance of Turning, in the place of Craniotomy, in cases of contracted pelvis; and the subject is of so much importance that I shall endeavour to give as succinctly as possible an outline of Prof. Simpson's theory and practice upon this point. It should be pelvis with a diminution of the conjugate diameter. The bi-parietal diameter varies in the natural fœtal cranium from 3½ to 4 inches, but it may be compressed to 2½ or 3 inches, for the short time during which the head may be drawn through the pelvis, without necessarily destroying the child. Denman was of opinion that the living fœtal head would bear a greater amount of compression than this. In delivery by turning, the child is drawn through the pelvic opening; in vertex delivery, it is pushed through from behind; and there are many instances in mechanics, in which bodies can be drawn through openings which no amount of force applied from behind would make them pass. In the case of the fœtal head and the deformed pelvis, Dr. Simpson believes that in vertex labour, when the vertex does not readily enter the pelvis, it is bulged or squeezed out laterally, and the bi-parietal diameter increased, by the pressure of the body of the child under the influence of uterine contraction. This is illustrated by the following diagram. (Fig. 165.)

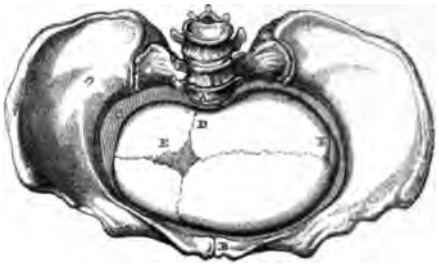
FIG. 165.



Section of fœtal skull. The dotted line, *a a*, *b b*, *c c*, represents the normal outline. 1, 2 2, represents the alteration produced by the compression described.

If the bi-mastoid diameter first comes into the pelvis, a different form of compression occurs. When the vertex descends first, it is the base of the cone formed by the fœtal head which first attempts to pass through. When the bi-mastoid diameter presents at the pelvic brim, it is the apex of the cone represented by a transverse section, which passes first. The tendency of the bi-parietal diameter is to increase in vertex cases, when the vertex does not readily enter the brim; but when the bi-mastoid diameter enters the pelvis animal, and bears a short interruption to the utero-placental circulation without a necessarily fatal result. The cord may

FIG. 167.



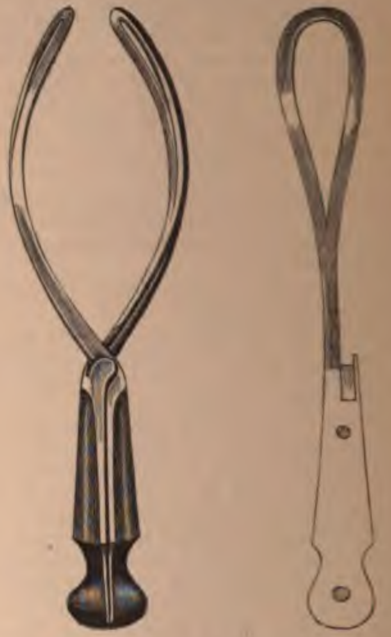
Deformed pelvis and compressed fœtal head. A. Promontory of sacrum. B. Symphysis pubis. C. Space between forehead and ilium. D. Depression in fœtal head. E, F. Anterior and posterior fontanelles.

also generally be guarded to some extent by being placed at the sides of the pelvis, in the position affording most room. It is in deformed pelvis with diminished antero-posterior diameter; or on oblique deformity, that turning promises the greatest chance of safety to the mother and child, and not in the contractions of the transverse diameter. The limits of the deformity within which a living child may pass in turning have yet to be determined. Dr. Fleetwood Churchill puts it at two inches and six-eighths; but as the limit for the passage by the vertex is three inches and a quarter, a considerable latitude for the operation of turning exists. The objections to the measure are—the injuries which may be done to the mother; the difficulty of diagnosing the exact amount of deformity; and of performing craniotomy when turning has been tried, in cases where it is subsequently found that the head cannot be delivered without reduction. As regards the injuries done to the mother, the cases on record and the statistics of the operation certainly do not show them; and it was the opinion of Denman that craniotomy in such cases was almost as easy as in cervix presentations, so that there is every reason to hope that with the knowledge we now possess of the condition of the fœtus by auscultation, and the advantages afforded by chloroform in such cases, turning will be per-could suffer for conscience' sake, in the fact of his flight into Holland on account of espousing the cause of James II.

The short, straight forceps, termed Denman's forceps, chiefly in use in this country at the present day, is essentially the same instrument as that devised by the Chamberlens. The chief alterations and improvements made in it were the work of Smellie. The most perfect Chamberlen forceps had the handles bent in the form of hooks; for these Smellie substituted handles of wood. As Chamberlen left the joint, it resembled that of the common scissors, but without the pivot, the joint being made secure by a piece of tape or cord passed through a hole in each blade, and wound round them after they were put in apposition. In another specimen of the Chamberlen forceps, one blade is provided with a fixed pivot, to receive upon it the other blade and secure it. This is called in the present day the German lock, and has been improved upon in the instrument called Naegelé's forceps. In lieu of these somewhat clumsy arrangements, Chapman invented the lock now in use.

This forceps, known as the Straight Forceps (Fig. 168), consists of two separate blades, which are introduced separately, and which, by locking, are converted into one instrument. These are called the left hand or male blade, and the right hand or female blade. Each blade consists of a handle, a shank, and the curved portion or clam, which adapts itself to the side of the head of the child. The ordinary straight forceps now described has but this one curve, which may be called the Cranial Curve, as its special relation is to the head of the child. The length of the curved portion of the blade is about eight inches. The curved portion of each clam contains a fenestrum or opening fitted to receive the parietal protuberance, and, when both blades are in apposition, to allow the fœtal head to protrude somewhat through the sides of the instrument. The length of the whole instrument is about twelve inches. The distance between the most curved portions of the clam is about three inches. When the handles are in perfect apposition, the extremities of the two clams are about an inch apart. The length of each fenestrum is about three inches. When the instrument is in action upon the head, the extremities of the handles are about one inch asunder, and not close together as when the instrument is held in the hand. Its whole weight should not exceed twelve ounces. Of course, it is necessary that the steel should be of the finest temper, to resist the force which is to be exerted in some cases of extraction of the head. The edges are bevelled off in every direction, to prevent injury either to the child or the mother. It was formerly the fashion

FIG. 168.



Short straight forceps.

to cover the forceps with wash-leather, this being done with a view to make the appearance of the instrument less martial, and to present a soft surface to the maternal passages and the fœtal head. Some advocate this proceeding at the present day, but the great majority avoid it, on account of the increased bulk and difficulty of passing the blades, and also the risk of carrying the infection of gonorrhœa or syphilis. The infectious principle of contagious fever ought, perhaps, still more to be held in dread. Some instruments are now sold covered with gutta percha, but nothing is so perfectly clean or so easy of introduction as the naked metal, anointed with oil, lard, or glycerine.

This instrument is calculated for the delivery of the head from the lower and also from the middle strait of the pelvis, or when it has in great part emerged from the pelvic canal, and is resting on the perinæum. The circumstances which all admit to call for the use of the forceps, are the arrest of the head in the pelvis or at its outlet, from entire failure of the pains, or such a condition of the mother or the child as would place either or both in a state of risk in the event of delivery not being completed. Its most common use is in cases of suspended labour from inactivity or exhaustion of the uterus. As compared with craniotomy, it may be said to be a child's operation, but the forceps is not entirely, as Dr. Meigs would teach, a child's instrument, since it is sometimes used quite as much for the safety of the mother as of the child. Besides failure of uterine action, it is sometimes called for in consequence of moderate deformity of the pelvic outlet. In cases of twins it is occasionally necessary to use the forceps, to deliver the first child, when the head presents. It is used in face cases, particularly when the head of the child is large, and the pelvis of only moderate dimensions. In occipito-posterior presentations, when the head is large, and especially in first labours, the forceps may become necessary. In cases of arm-presentation with the head, the forceps may also be required. The instrument is used in some cases of funis presentations; in cases of turning, or breech-presentation, in which there is difficulty in delivering the head; in rupture of the uterus, when the head is low down, and is not retracted to any great extent; and in cases of convulsion, flooding, or any other accident of labour, which may render immediate delivery necessary to save mother and child from peril. The forceps is more often called for in primipara than multipara.

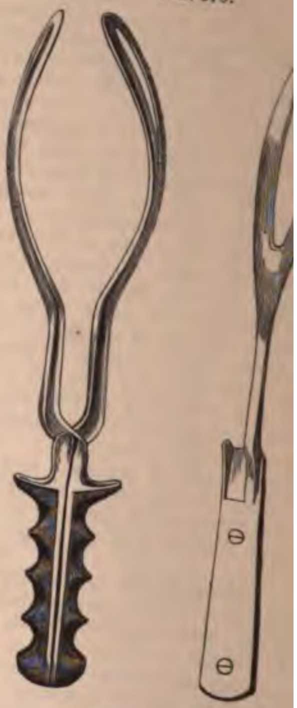
The conditions necessary to the use of the short straight forceps are, that the os uteri should be well dilated, and partly or entirely retracted over the head of the child. Dr. Meigs says that "a man shall hardly be justified who inserts his forceps within the os uteri. He must wait until the neck has risen above the parietal protuberance, and can no longer be felt." Dr. Ramsbotham states that it may be used in some with, in which, though the os uteri is fully dilated, it is not retracted above the head. With many distinguished accoucheurs it is laid down as a rule never to apply the forceps unless an ear can be felt. The late Dr. Merriman especially affirmed that no case can be "esteemed eligible for the application of the long forceps until the ear of the child can be distinctly felt." There can be no doubt of the correctness of these dicta, as far as the short forceps commonly is concerned. Another rule is, that the head should have rested on the perinæum six hours, and the pains ceased for this length of time; but numerous cases in which the forceps is required entirely contravene this dogma. The use of the forceps should not be attempted when the os uteri is undilated, when the soft parts are in a state of inflammation, when the pains are violent, or when any considerable pelvic deformity exists.

Very numerous have been the minor modifications of the forceps, but some of the improvements of the instrument appear destined to last as long as the forceps itself. I have spoken of the single or Cranial Curve of the original instrument. To this, Smellie and Levret added another curve, the convexity of which looks towards the sacrum, and the concavity towards the pubis. This may be called the Pelvic Curve, to distinguish it from the curve already referred to. One curve has reference purely to the head of the child and the safety of the fœtus; the other relates entirely to the pelvic cavity, and is solely intended to shield the parturient canal from injury. Besides this, Smellie increased the length of the shank or space between the handles and clams, in connexion with the pelvic curve, with a view to the extraction of the head from the pelvic brim. This was the forerunner of the long forceps of the present day.

As regards the addition of the pelvic curve to the short forceps, authorities differ very considerably; but I believe that eventually the double, or the cranial and pelvic curve, will be generally adopted. By the use of the pelvic curve, less danger of those horrible accidents leading to vesico-vaginal fistula by pressure on the pubis, and to laceration of the whole of the perinæum, and fusion of the vagina and rectum by posterior pressure, is incurred. The short forceps with the double curve is commonly used, we are informed by Dr. Meigs, in America. Prof. Siebold of Berlin, and many others in Germany, have adopted the improved instrument, and its

use is common in France. In this
forceps belongs *par excellence*, the do
comparatively little favour, notwithst
instrument and example of Dr. D. Da
lieve, because the matter has not yet sei
attention.

Fig. 170.

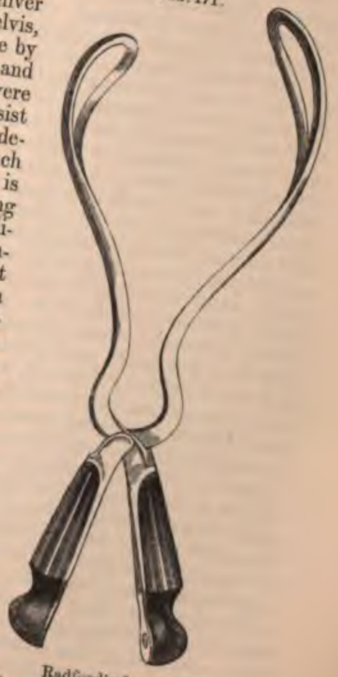


Long forceps.

The Long Forceps is an important alteration
instrument. It is not merely a variation of f
applied to an order of cases altogether different

which the short forceps is useful. The short forceps is
adapted for the delivery of the head from the perinæum, or the
middle strait, or outlet of the pelvis. The Long instrument
is suited to its extraction from the brim of the pelvis, or
even from above the brim. For this reason, the shank is
lengthened, and the best instruments possess the double
curve, to adapt them to the axes of the pelvis and the par-
turient canal. For extraction when the head is at the brim,
the short forceps is generally inadequate, without risking the
laceration of the soft parts of the mother. One of the earliest
anecdotes connected with the forceps, is that of Mauriceau,
who relates that Dr. Hugh
Chamberlen coming to Paris,
rashly undertook to deliver
a dwarf with deformed pelvis,
who had been left to die by
he French obstetrician, and
fter several hours of severe
xertion was obliged to desist
ithout completing the de-
very. It is to relieve such
ses, when the deformity is
t too great, that the long
ceps is peculiarly appli-
ble, and, with the long in-
ument, Chamberlen might
e been spared his own
tification and the cen-
s of the great French
ucheur. Dr. Radford has
sed a long forceps in
h the blades are of un-
length, the short blade
intended to go over
cciput, and the long
over the anterior part
e head, in ordinary
presentations.
a preliminary to the
he forceps, the bladder
tum should be emp-
d the patient brought
edge of the bed in

FIG. 171.

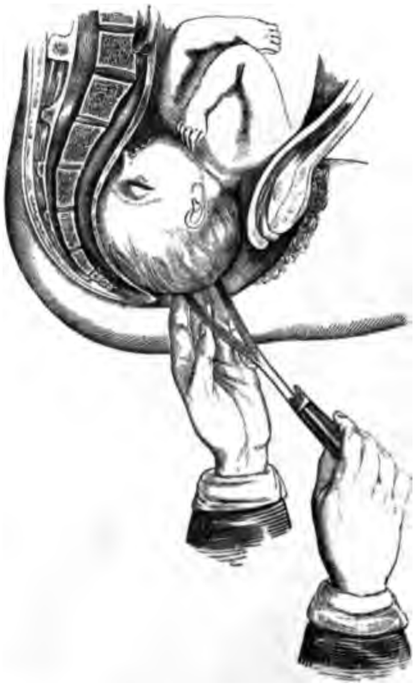


Radford's forceps.

sary to the proper use of the forceps, that we should know the exact position of the head. For this purpose we are told by many authors of the present day, to pass two or three fingers, or the whole hand, between the fœtal head and the pubis, to find out the position of the ear. But such manipulations are quite unnecessary, if we are familiar with the methods of diagnosing the position of the fœtal head by the examination of the sutures and fontanelles by the index-finger, as detailed when the different presentations of the head were under consideration. This ought to give us all the information we require in the use of the forceps as regards the position of the fœtal head.

Taking the first position for our description, the following is the mode of proceeding with the short forceps:—The first blade should be held lightly in the left hand, the first one or two fingers of the right hand being passed a short distance over the head, behind the right portion of the pubic arch. The end of the blade should now be introduced through the ostium vaginæ, and passed upwards between the finger and the head. In this procedure the handle of the instrument requires to be depressed considerably. The end of the blade should be kept lightly but pretty closely in apposition with the head as it glides onwards. With the finger we should aim, if possible, to pass the instrument over the ear of the child, and under the rim presented by the os uteri. When these cannot be felt, or when the blade cannot be passed, while the finger is at all deep in the pelvis, we shall find these obstacles are best perceived and avoided, by holding the instrument almost as lightly in the hand, as a probe. After the blade has first come in contact with the head, we must go on depressing the handle until we have reached the summit of the cranial vault. After this point, the handle has to be raised until it has passed over the side of the head, in the direction of the right foramen ovale. Care must be taken not to damage the ear, or the margin of the os; and in case of any difficulty, it is always right to withdraw the blade partially or entirely, in order to detect the impediment. The highest skill in the use of the instrument is to pass it with the utmost gentleness. We should, of course, know the position of the head in all cases. But it is not, after all, hair-breadth knowledge we require. The instrument is so admirable and perfect in its relations to the pelvis and the fœtal head, that blade, and head, and pelvis, concur in aiding the operator, and in depositing the instrument in sed over the head in the direction of the left sacro-ſnchondrosis; and the second blade, held in the right is to be passed, with the precautions already described, he opposite side of the head. The handles should now ıwn together, and if the blades have been properly l, the handles lock readily, and the position of the blades lered perfect and fixed by a moderate compression of ındles. Great care must be taken to guard the ostium ı during the process of locking, so as not to pinch or

FIG. 173.



Introduction of the second blade of the forceps.

first, but gradually increased to the extent that may be necessary, intervals of rest being allowed when the pains are off, or in imitation of pains. Besides the efforts of traction, the handles should be moved a little from side to side in extracting, so as to use each blade in succession as a lever. As the head descends, the handles should be brought forward between the thighs of the mother, and as the head is expelled, they should, if the instrument remains on, sweep over the abdomen in the direction which the head itself would take if its movement were prolonged. When the head is emerging from the pelvis, we must be careful not to direct the handles too much backwards, as this endangers the bladder and the anterior vaginal wall from the anterior blade. When the head is on the perinæum, the handles should not be pressed too far forwards, otherwise the perinæum is ploughed up by the posterior blade. When the head is passing through the ostium vagina, care must be taken not to lacerate the perinæum. It is best at this moment to unlock the instrument, just as rowers unship their oars to avoid collision, or the posterior blade may be withdrawn altogether, and expulsion allowed to take place by the natural efforts. After the operation an opiate is generally administered, the vulva should be fomented carefully from time to time, and symptoms of inflammation or sloughing carefully attended to. I am of opinion that in cases where the patient does not prefer to remain conscious, or when the head is very low on the perinæum, chloroform should be used in delivery by the forceps. In the first case in which I used chloroform in a forceps case, the instrument was applied to the head without it by the medical man who asked my assistance; but the patient was of nervous temperament, and on the slightest attempt at traction her movements were so violent as to render it impossible to proceed, and the alternative was between chloroform or craniotomy. The advantages of having the patient quiet and free from pain are very great. The forceps acts as an extractor, a double lever, and a compressor. The limits of its action as a compressor must depend on the difficulties to be overcome, due regard being had to the safety of the child.

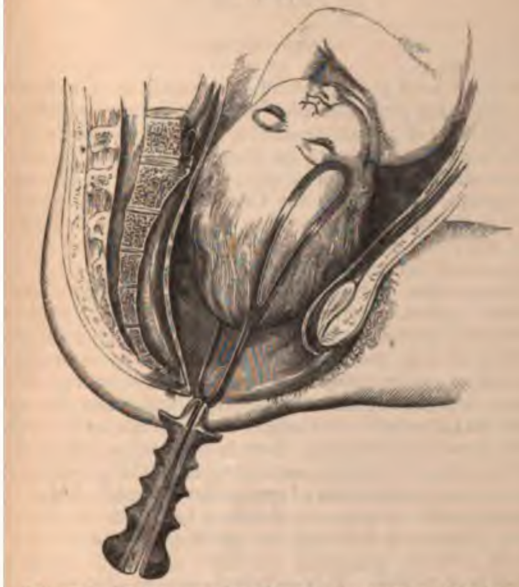
In the other positions of the head, or in face cases requiring assistance, the same general principles are to be followed in applying the short forceps as those already laid down. To operate perfectly, the blades of the forceps should always be conjugate diameter, where the head will not enter the brim, or descend below it, by the unaided force of the uterus, or where the head lodges at the brim from any other cause. When the head presents at the brim, it will be remembered that the long diameter lies in the transverse, as in one of the oblique diameters, or more commonly in a position between the transverse and one of the oblique diameters. The head of the child is also in the state of Flexion—that is, with its chin bent upon the sternum. As a consequence, the vertex, and not the apex, of the vault of the cranium, is the most depending part. Under these circumstances, the blades of the forceps cannot be applied on each side of the child's head, because these sides are in apposition with the pubis and the sacral promontory, between which points the constriction exists. The forceps are in such cases introduced chiefly with reference to the anatomy of the pelvis, and not to the anatomy of the fœtal head. The two blades are passed up, one on each side of the pelvis, and they then fall mechanically into, or approach towards that oblique diameter, opposite to the diameter which is occupied by the head itself. The parts of the fœtal head actually grasped by the blades are the occiput and the forehead. The grasp does not, however, seize the long diameter of the head exactly, but a diameter between the longitudinal and the transverse or bi-parietal. The ends of the blades reach, on one side to the nape of the neck, and on the other to the base of the brow, but they do not pass over the face. Greater care is necessary in extracting with the long than with the short forceps, because the direction in which extractive power has to be exerted is more complicated, and because the instrument is more powerful than the short forceps. Care should be taken not to use such force as may injure the mother; and if, after endeavouring, within this limit, to effect delivery, we are obliged to resort to craniotomy, we shall perform this operation with less hesitation or misgiving when we know that no alternative remains.

No doubt, the use of the long forceps is a weighty matter, and not to be undertaken without due and serious consideration. But the alternative must be remembered—namely, the performance of craniotomy, and the inevitable destruction of the child. By craniotomy, too, a far greater amount of danger to the mother is incurred. In cases of pelvic contraction, to such an extent as not utterly to preclude the possibility of the passage of a living child, the long forceps should

always, unless some great peculiarity exist
attempting delivery in this way, we shal
certainly resort to craniotomy with a cleare
would otherwise be the case. In London t
forceps has been a subject of grave dispu
of the most experienced obstetricians of this
may be said to represent those who oppose
Ramsbotham and others defend it. It has
Edinburgh by Dr. Hamilton and Dr. Simps
has found little favour, particularly at th
Hospital, the different masters having oppose
but Dr. McClintock, the present master, a m
and unprejudiced obstetrician, who was rec
informed me that he had, within a short ti
forceps on two occasions with success, and
self a convert to its use. Dr. Fleetwood
commends its employment. Its utility is
in America, and also in France and Germ
objection urged against the use of the lo
injury done to the mother by operations abo
most of these injuries have been owing to th
forceps in this situation, for which they are
The impossibility of introducing the forceps
the brim has been dwelt upon, but this
applies to attempts to introduce the blade
posterior diameter. In the transverse dia
oblique diameter opposite to that in which t
there is often as much room in contraction
diameter as in the normal pelvis. It has also
the action of the forceps, as a compressor,
sides of the pelvis, must bulge the bi-pari
that part of the head opposed to the conju
the pelvis, and thus increase the difficulty o
the head. But, as already stated, the forcep
obliquely, and not in the antero-posterior d
any retardation caused by the bulging of t
than compensated for by the extractile actio
The supposed injuries done to the face of the
dwelt on, but it can be shown anatomically, a
of practice, that the anterior blade of the
extend beyond the root of the nose. The
use of the long forceps are, in my opinion,
or invalid, and such as, on the introducti

ceps, might have been urged with almost equal weight ainst that instrument.

Fig. 176.



Delivery by Dr. Simpson's long forceps in contraction of the brim.

The Vectis, or Lever, was formerly much used in difficult bours, but for a long time it fell into desuetude, having been mpletely superseded by the forceps. In recent years, its e has been revived to some extent, to rectify mal-positions, d expedite delivery. One blade of the short straight rceps makes a very good vectis, and will do all that can be fected with this instrument.

CHAPTER XLV

EMBRYOTOMY.

THIS is the most positive of all the op
The only other procedure with which it
the induction of premature labour befo
child has been reached. In the Ind
Labour after the seventh month; in T
the Forceps, and even in the Cæsarian
safety is afforded to both mother and c
tomy, the child, if alive before the comm
ration, is inevitably sacrificed.

The operation is considered necessar
deformed pelvis, obstruction from tum
induction of premature labour has been
in cases of arm presentations, hydroce
hæmorrhage, exhaustion, &c., when the
mother imperatively calls for delivery,
cannot be extracted by the long or short f
Under these circumstances, there is no
great majority of British accoucheurs as
fitness of the performance of craniotomy
Denman justly observes, in deciding in
ration, we are only following the dictates
difficult labours, commonly sacrifices t
mother is destroyed. It is equally a canc
the operation should never be performe
sultation, and in the face of the most ur
it may be said that, apart from all quest
section, there is a general belief on th
America, having, I fear, a foundation in t
tion has always been performed too freque
in this country.

It is of the greatest importance, with re
common condition of instrumental labour
excessive deformity of the pelvis, that t
decided, as far as possible, within which t
mature labour by the forceps may, or cr
performed. As regards the induction of
may be said that it applies to ALL cases of

being the province of art to decide at what time this operation should be performed in each particular case, and whether it should be resorted to before or after the viability of the child. There is, probably, no case of deformity or exostosis, where menstruation and fecundation can occur, so profound but that the detachment and expulsion of the ovum might be procured within the first two or three months after impregnation, by the uterine sound, or an elastic tube and douche. When this has not been accomplished, and pregnancy has gone on to the full term, we have to consider the alternative operations of the forceps, turning, embryotomy, or the Cæsarian section. The use of the forceps is generally inadmissible in cases where the distortion exists to such an extent that the antero-posterior diameter is below 3¼ inches. When the application of the long or short forceps is impossible, turning may be practicable between the limits of 3¼ inches and 2½ inches. The Cæsarian section comes into the field in cases of high and unyielding distortion, where the antero-posterior diameter is 1½ to 2 inches or less. Between the point at which turning becomes impracticable, and at which there is no resource but the Cæsarian section, lies the domain of craniotomy. It is the proper resource in cases where the antero-posterior diameter is from 2½ inches to 1½ to 2 inches. In cases where some other condition than mechanical disproportion comes into operation, as in cases requiring immediate delivery, and complicated with hæmorrhage, convulsions, &c., craniotomy may be sometimes necessary, but it ought in every case, as far as possible, to be superseded by the forceps or by turning where these operations are practicable.

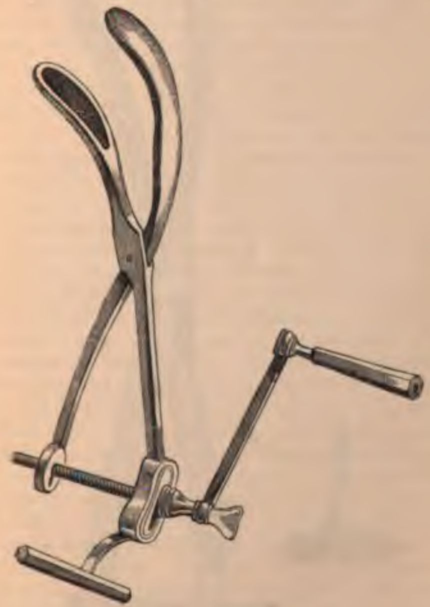
The statistics relating to embryotomy are of great importance as throwing light on the proportion in which the operation is fatal to the mother. Dr. Fleetwood Churchill has collected 342,495 cases of labour in German practice, in which embryotomy was performed 243 times, or in 1 every 1409½ cases. In 129,331 cases in British practice, embryotomy was resorted to 378 times, or in 1 in every 342½ cases! In France and Italy, out of 38,908 cases, this operation was performed 69 times, or in 1 in every 563¾ cases. Thus the proportionate frequency of the operation stands as 1 in every 342 cases in this country, 1 in every 563¾ in France and Italy, and only 1 in 1409½ in Germany! In 371 cases in which the result to the mother is stated, death ensued in 69, a fatality equal to 1 in 5⅓ of all the cases. Thus craniotomy, though a comparatively easy operation, is far more fatal to the mother than the is also resorted to at an earlier period on the Continent and in America, when it is considered necessary, than in this country, and Dr. Simpson has shown that no other circumstance exerts so prejudicial an effect, as the prolonged duration of labour. While it must be allowed that in the matter of artificial deliveries more mothers are lost in this country than on the Continent, the gross maternal mortality in this country is more favourable than in foreign countries. But it is not only as regards the mother that our own statistics of artificial delivery are unfavourable. Out of every 100 cases, Boivin lost 28 children; Arneth, 34; Lachapelle, 36; Boer, about 47; Dr. Johnson, 76; and Dr. Collins, 77. If we can rely on these statistics, which there is little reason to doubt, the fœtal mortality in this country in artificial deliveries is nearly double that which obtains upon the Continent. The result of these statistics is to show very clearly that craniotomy is an operation to be avoided upon every possible occasion, and that in no case should it be undertaken, whether the child be alive or dead, when turning or the short or long forceps can be substituted in its stead. It is only less horrible than the only alternative which remains to us, when it is absolutely unavoidable—namely, the Cæsarian section, and in the following proportions:—Embryotomy is fatal to the mother in about 20 per cent., while the Cæsarian section destroys from 60 to 70 per cent. on the Continent, and between 80 and 90 per cent. of the mothers in cases operated on in this country.

When the deformity is not excessive, the operation is a comparatively easy one. It is only in cases of high distortion, where what is called piecemeal extraction is required, that great difficulties are met with in its performance. The instruments used consist of the Perforator, the Crotchet, the Embryotomy Forceps, the Cephalotribe, and several kinds of blunt and cutting Hooks.

Various forms of perforators are used. The most common is the scissors-like instrument of Smellie, modified to some extent by later obstetricians. It consists of two blades with shoulder-stops, and cutting edges between the stops and the points. In using the instrument, it is inserted as far as the stops, and the handles are then separated by the fingers. The most modern and perfect instrument is a modification of Naegelé's perforator, which is used by bringing the handles together; and gives the operator considerably more power able instruments. In some, the scissors-joint, and in others the forceps-lock, is used. The cutting-hook, invented by Dr. Ramsbotham, for cases requiring decollation or the amputation of limbs, and a blunt hook, complete the embryotomy instruments in general use in this country.

In the Cephalotribe, a mechanism altogether different is relied upon. Immense strength in the blades, and great power of compression is obtained, and the fœtal head, including its base, is crushed by the grasp of the instrument. The cephalotribe of Baudelocque is two feet in length, and weighs about four pounds, being altogether a most repulsive-looking instrument. The crushing-blades are brought together

FIG. 180.

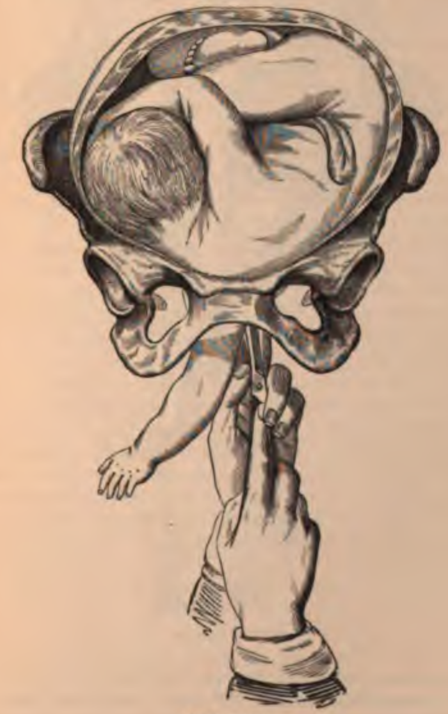


Baudelocque's cephalotribe.

stituted for the screw in approximating the handles. (Fig. 181.) The latest instrument I have seen measures 18 inches in length; its blades are $1\frac{3}{4}$ inches in width, and it weighs 3 pounds. The lock of the blades is the same as that of the French forceps. The cephalotribe is used by Paul Dubois and the leading French obstetricians, in preference to the perforator and crotchet, in cases where the child is dead, or where the pelvis is too contracted to admit of the use of the forceps. The advantages claimed for this instrument are, that it avoids the dangers of the crotchet, and that it is far less fatiguing to the accoucheur than the ordinary mode of extraction. It is not, of course, applicable to cases of high pelvic distortion. It is impossible to examine the instruments used in embryotomy, and to deal with cases requiring its performance, without feeling that instrumentation has by no means reached perfection in this department of the obstetric art. Ultimately craniotomy will, in all probability, be restricted almost, if not entirely, in the case of living children, to cases requiring piecemeal extraction. We require instruments for this purpose better than any which have hitherto been constructed, and it seems likely that modifications of the lithotrity and bone-cutting instruments used in general surgery may be found very useful in breaking up and extracting the fœtal head.

In using the perforator, the first two fingers of the left hand are introduced into the vagina so as to reach the parts of the head selected for puncture. Along these fingers, the instrument is passed as on a director, and, with the right hand, forced gently but firmly, by a semi-rotatory movement, into the head as far as the shoulder-stops. The blades are then opened widely, and the part of the head into which they are introduced is thus divided. The instrument is now withdrawn a little, and re-inserted in a direction at right angles to the first incision, when the blades are dilated as before. This proceeding leaves a crucial opening in the fœtal cranium. The point of the head at which the perforation should be made has been a subject of considerable dispute. Some advocate perforation at the sutures or fontanelles; but it is an objection to this procedure, that when the bones become compressed, the opening is obliterated, and the discharge of cerebral matter interfered with. The best point for perforation is the middle or posterior portion of the parietal bone, because an opening in this situation enables the operator to apply extractive force with the head in the most natural and advangerous than the crotchet. With any of these instruments the greatest care is necessary in guarding the soft parts of the mother from injury, and avoiding lacerations of the vagina and perinæum by the instrument or by spiculæ of bone. Great force is sometimes required with the crotchet and craniotomy forceps, and the completion of delivery may occupy many hours. As far as possible, it is a rule in craniotomy to save the scalp and integument, so as to cover and guard the bones from injuring the mother.

FIG. 184.



Embryulcia.

invented a vertebral hook, considerably longer in the shaft than the ordinary blunt hook, and calculated to be of very great service.

In cases of high distortion, such, for instance, as those described by Dr. Osborn and Dr. Meigs, extraction by any instruments would be impossible without the assistance afforded by the decomposition of the fœtus. These cases sometimes spread over two or three days, in which time the soft parts of the fœtus are reduced almost to a diffluent pulp, and the loose bones are contained within the skin somewhat as in a bladder. The fœtor in these cases is great, and the uterus may be distended with gases resulting from decomposition; but less mischief arises from these sources, or from the delay and pressure, when the cranium has been decerebrated, than from forcible attempts at extraction. It is very common with those obstetricians who have most distinguished themselves in such cases to express a regret, at the termination of their cases, that they did not wait more patiently, and trust more to the aid afforded by putrefaction. It is almost incredible how small an aperture a fœtus in a state of decomposition will pass through. Dr. Simpson, in a case occurring at Cupar, was able to draw a child 18½ inches long, in a state of considerable decomposition, through an opening in a piece of iron only 2⅜ inches long by ⅞ of an inch wide. When we have to deal with a dead fœtus, the circumstances under which craniotomy can be performed in high distortion, are the most favourable which can exist; and when the fœtus is destroyed early in labour, a few hours will do much towards promoting decomposition, so that if extraction can be delayed twenty-four or thirty-six hours, the fœtus becomes greatly disorganized. Death, the admission of air, and the high temperature kept up by the uterus and liquor amnii, afford very favourable conditions for putrefaction in the comparatively soft structures of the fœtus. It were to be wished that art could supply some means of making fœtal decomposition still more rapid in such cases. But even in cases of decomposed fœtus, the cranium has, in the worst cases, to be picked out bit by bit and bone by bone, or the large bones have to be broken up. In his case of delivery in a pelvis of two inches in the antero-posterior diameter, Dr. Meigs relates that he was occupied several hours in getting away as much osseous matter as would go to make up a parietal bone.

Considerable difference of opinion has existed as to the time at which craniotomy should be performed. Dr. Collins has especially laid it down, with almost the distinctness and positiveness of a law, that in difficult labour the child is always dead before the mother is placed in such a position of danger as to require immediate delivery. Drs. Hardy and McClintock have followed Dr. Collins to a considerable extent in this particular. The wisdom of the rule thus sought to be enforced by these eminent accoucheurs may, however, be questioned. When there is a positive certainty that the child cannot be born alive—when turning is impracticable, or when delivery by the forceps has been vainly attempted, there is no object to be gained by delay. There is little distinction, in a moral point of view, between standing by while the fœtus dies and the actual performance of craniotomy; but it may make every difference to the chances of safety to the mother to have to deal with a dead fœtus upon whom perforation has been performed, and in whom the processes of putrefaction and softening are going on, and with the solid head of a living child, pressing under the force of uterine action, upon the soft contents of the pelvis. No doubt it must always be a satisfaction to know, when the certainty arises that craniotomy is inevitable, that the child is already dead; but this event cannot, in cases of high distortion at the full term, be waited for except with risk to the mother. It would probably be better to be without auscultation altogether, in such cases, than to make it the ally of timidity and procrastination. In every case where the smallest promise of such a solution of the difficulty exists, turning or the application of the long or short forceps should be attempted; but the moment we are positively certain that the head cannot pass naturally or artificially without perforation, but that with perforation it may pass, we should prepare for craniotomy, with little reference to the question of whether the mother can bear an hour or two of additional suffering, or whether the child may linger a few hours more or less before it expires from compression.

CHAPTER XLVII.

THE CÆSARIAN SECTION.—CHLOROFORM.

The Induction of Premature Labour, Turning, and the use of the Forceps, are the great operations of what may be termed Conservative Midwifery. Opposed to these are two capital operations, never to be resorted to save in the last necessity—namely, Craniotomy, which has been considered in the preceding chapter, and the Cæsarian Section or Hysterotomy. In the one the mother is almost surely, in the other the child is certainly, sacrificed. Premature Labour, Turning, and the Forceps are in distinct antagonism to Embryotomy and Hysterotomy, and the tendency of all obstetric improvements has been to substitute the conservative for the destructive operations, and to circumscribe more and more the ground which the latter occupy. The Cæsarian section was probably suggested by cases in which gravid women had the mature fœtus forced through the uterus and abdominal walls by accidents, such as falls, or the goring of bulls; or by those rare instances in which, in cases of impassable deformity of the pelvis, the uterus and abdominal parietes have been ruptured by the force of the pains, and the child extruded. The operation is of very ancient date, like most of the capital operations performed on the human body. Esculapius himself, and a number of other ancient and Middle-age celebrities, are said to have entered the world in this manner. Art does not appear to have diminished the dangers or the mortality of the operation. With one or two exceptions it is, and probably will ever remain, the most formidable operation which can be performed upon the living body.

Dr. Fleetwood Churchill has carefully collected the statistics of abdominal hysterotomy. He collected from foreign authorities the particulars of 371 cases in which the operation was performed. Of these, 217 mothers are reported to have recovered, and 154 to have died, the deaths being 1 in 2⅓. Some of these cases are, however, so old, as to be traditional rather than historic; but the records of 321 operations, which have occurred since the year 1750, show that only 149 mothers recovered, to 172 deaths. Kayser collected 339 cases, in which a fatal result occurred to the mother in 210 cases, 129 mothers being saved. Dr. West has noted 409 authentic cases: in 251 the mothers died, and the recoveries were 158. The largest statistic of this operation is that of Figueiria, who gives 790 cases, in which the deaths were 424, leaving 366 recoveries. Many of the cases are, of course, repeated in these several collections, but they give, no doubt, a tolerably correct account of the mortality of the operation. In Great Britain, the operation has been considerably more fatal than on the Continent, the difference probably arising from the fact, that here the operation is commonly resorted to only after labour has continued for some time, and after other means of delivery have failed, while abroad the operation has been performed on healthy women, the subjects of deformity, at the commencement of labour. Dr. Merriman collected the results of 26 cases occurring in this country; of these only 2 mothers were saved, and 24 lost. Dr. Churchill has analysed 63 British and American cases, out of which 18 mothers recovered to 45 deaths. In the great capitals, London, Paris, and Vienna, the mortality is far greater than in other places, and with the single exception of Dr. Oldham's case, where the patient suffered from carcinoma uteri, and died a considerable time after the operation, I believe abdominal hysterotomy has never been performed successfully in this metropolis. Within the last few years it has been performed in London under every circumstance which could be devised to procure a favourable result, five times, with a fatal result in four cases. Dr. Oldham's case was probably an exemplification of the law, that the abdominal and pelvic organs while in a state of disease bear operations well. The most favourable of these results are sufficiently discouraging, when viewed in a tabular form. The matter is still more tragic when we come to the individual case, and have to estimate the chances of recovery from such a formidable operation. It must be borne in mind that the known statistics of the Cæsarian section are sure to be more favourable than the real results. Successful cases are certain to be blazoned abroad, and those which are unsuccessful mentioned as little as possible. Kayser observes that the recorded mortality from this operation in lying-in hospitals, where all the cases are reported, is considerably greater than the recorded mortality in private cases, where suppressions are possible. The hospital mortality reaches to 79 per cent. Dr. West places the mortality in this country, at the lowest estimate, at 83·6 per cent.; but even this is probably lower than the real mortality, could every case be collected. Of the five operations performed in London within the last few years, one of the fatal cases has never, as far as I am aware, been reported.

Dr. West has made a very able analysis of the cause of death, and the date of its occurrence, in 147 cases of death from the Cæsarian section. His table shows that death is distributed between shock, hæmorrhage, and inflammation. 55 cases died of inflammation between the 2nd and 20th day, and 1 after that time. The number of deaths from shock to the nervous system was 33, the period of death varying from one hour to six days after the operation. 14 cases died of hæmorrhage, between the time of the operation and the sixth day. The deaths in the remaining 44 cases took place from the combined results of hæmorrhage, shock, and inflammation, or from causes independent of the operation itself. The fatal result takes place with great rapidity in the majority of cases, as shown by the fact, that out of the 147 cases tabulated by Dr. West, death occurred in 108, within 96 hours after the operation. Dr. West sums up the peculiar dangers of the operation under four heads:—1. Hæmorrhage, not only from the wound, but from the placental site. 2. The shock to the nervous system from the violent interference with labour, and the injury inflicted on the uterus. 3. The exposure and incision of the healthy peritoneum. 4. The infliction of an extensive wound upon the uterus at a time when the processes of Nature are prepared, not to carry on reparation, but to effect the degradation, disintegration, and absorption of the uterine tissue. Attention has been specially directed to the state of the uterine wound after the operation, by Dr. West. In many cases no attempt at repair or the formation of new tissue takes place; in others, actual sloughing and loss of substance occurs, the wound gaping widely, when death has occurred many days after the operation.

The Cæsarian section has been resorted to for the safety of the child more frequently than for that of the mother, but the statistics of the operation demonstrate beyond question that the amount of fœtal mortality is very great indeed. In Dr. Churchill's list of 371 cases, the results to the child are given in 189 cases, 139 being saved, and 50 lost. But we may fairly infer that, of the 182 cases where the result is not given, the child was lost in all, or nearly all, which would, omitting twins, increase the fatal mortality to 232. Of the 63 occurring in British practice, 26 children were lost or still-born, and the result is not stated in 3 cases, making the probable mortality 29. In Dr. Merriman's collection of 26 cases, 11 children were saved and 15 lost. In the 409 cases mentioned by Dr. West, the result to the child is stated in 347 instances. In 237, the child was born alive; in 110 it was still-born. If we add the unrecorded cases to the deaths, the number becomes 172, exclusive of twins.

In a considerable number of cases it is a remarkable fact that the operation has been performed more than once upon the same subject. In 28 women whose cases are collected by Dr. Churchill, the operation was performed 74 times. Some of these cases have been doubted, on account of their antiquity; but within our own generation, Professor Kilian, of Bonn, performed the operation four times on the same woman. Between the years 1826 and 1836 it was also performed four times on a Danish woman. It would appear that in women who survive the first operation, a certain immunity from the dangers of the procedure is acquired. These cases, subtracted from the tables of the successful performance of the operation, or reckoned only once, increase the tabular mortality in women operated on for the first time.

We now approach one of the most momentous questions in obstetrics. Fortunately it is one not often presented to us for solution in practice. What are the circumstances under which abdominal hysterotomy may become justifiable or even necessary? No point has been more keenly debated, and perhaps no point of importance in midwifery is less definitely settled at the present time. There can be no doubt that the operation is less held in dread upon the Continent than in Great Britain. This is owing in some degree to the more favourable results of the operation, and to the greater value attached to fœtal life, in foreign countries. According to Busch and Moser, the Cæsarian section is the only practical mode of delivery when the diameter of the pelvis is two inches and a quarter or less, and the Cæsarian section is indicated if the diameter is from two and a quarter to under three inches, when the child is alive. Jacquemier is of opinion that hysterotomy is the only justifiable operation when the child is dead, and the pelvis is below two inches in diameter; or when, in the case of a live child, it varies from two inches to two and a half. These are amongst the latest authorities in Germany and France. Velpeau gives the diameter of the pelvis in 62 cases. In 30 of these, the pelvic diameter was from two inches to two and three-quarters, the variation in the remaining 32 being from one inch to two inches. Dr. Simpson truly observes that in this country the operation would not have been performed in the 30 cases in which the diameter extended from two inches to two inches and three-quarters. These measurements, it should be stated, refer to the antero-posterior diameter, and it seldom happens but that, on one side or the other of the pelvis, the diameter exceeds the diameter from the promontory of the sacrum to the symphysis pubis. In such cases, craniotomy would certainly be performed in British practice. Dr. Lee, the most strenuous opponent of the Cæsarian section, avoids giving any positive admeasurement limiting the operation, but he states that the operation should be reserved for cases in which the pelvic contraction is so great that the os uteri and the presenting part of the child are entirely out of reach. He speaks, however, of a case of Sir Charles Bell's, in which the antero-posterior diameter did not exceed an inch, and when the space on either side did not allow of the performance of craniotomy, in which, in labour at the full term, the Cæsarian section was necessarily performed. Dr. Fleetwood Churchill gives it as his conclusion, after reviewing all the points relating to the subject, that when the antero-posterior diameter of the brim is not more than an inch and a half, there is no resource but the Cæsarian section. Dr. Rigby considers the operation unavoidable when the child cannot be extracted piecemeal through the natural passages, but does not give any positive measurements which would justify the operation. Dr. Meigs teaches that the operation may be imperative in different diameters in different cases; and he considers it impossible to fix a minimum diameter through which a woman may be delivered. He states that if we go to diameters of an inch or an inch and a half, the Cæsarian section is inevitable, but that he should not hesitate in one case to recommend it in a pelvis the diameter of which ranged from two to two and a half inches, when a patient was in imminent danger; while in another, and less pressing case, he would as certainly, with the same diameters, advise craniotomy. Singularly enough, Dr. Meigs relates a case where the diameter was not beyond two inches, in which he delivered by embryotomy on two occasions, but in which the Cæsarian section was afterwards performed twice successfully, and once under the sanction of Dr. Meigs. No alteration had occurred in the state of the pelvis between the dates of the operations for embryotomy and hysterotomy. Dr. Ramsbotham considers the Cæsarian section the only alternative in labour at the full term, when the antero-posterior diameter is one inch and three-eighths, and a space of three inches and a half at the brim laterally, or with an antero-posterior diameter of an inch and a half by three inches. In two of the cases occurring in London within the last few years, the pelvic diameters have been published. In one case the antero-posterior diameter was three inches, but out of this the rami of the pubis projected forwards, with a beak more than an inch in length and about an inch in breadth. The distance between the tuberosities of the ischia was 1·2, and from the point of the coccyx to the symphysis pubis 2·8 inches. The child was saved. In the other case, the principal deformity was at the brim. The antero-posterior diameter measured two inches. From the sacral promontory to the right pectineal eminence there was also a space of two inches, and from the same point to the left pectineal eminence, two inches and a half. The diameters of the cavity and the outlet were not seriously contracted. The child was dead before the commencement of the operation. It is impossible to give too much credit to the distinguished practitioners concerned in these cases for their candour and skill, but it may be questioned whether in both cases delivery might not have been effected by piecemeal delivery. At this point of the argument, we must inquire what are the smallest diameters through which a child at the full term has compassed, either alone or with instrumental assistance. We have seen that Dr. Meigs delivered twice in a case where the antero-posterior diameter did not exceed two inches, and he distinctly states that he should not hesitate to undertake delivery in any pelvis of two inches in the antero-posterior diameter. I believe Dr. Lee entirely endorses this opinion, even if he does not go somewhat beyond it. In the celebrated case of Eliza Sherwood, in whom delivery was effected by Dr. Osborn, the antero-posterior diameter was only three-quarters of an inch, but there was a space on the right side an inch and three-quarters broad and three inches long. In the case related by Dr. Simpson, a fœtus, eighteen inches and a half long, passed through a cordate pelvis, so contracted at the outlet as to measure three inches from the coccyx to the symphysis, but only half an inch from the tuberosity of one ischium to the other. In a succeeding labour, hysterotomy was performed with a fatal result to the mother and child. In these and other cases of the passage or extraction of a child through a pelvis affected with high distortion, the child has been dead and in a softened condition, with complete separation or dislocation of the bones of the head. It may be said, then, that the limits for the performance of the Cæsarian section only ranges between a two-inch diameter of the pelvis from deformity, and its entire occlusion by exostosis. If cases can ever occur in which the operation is necessary above two inches, they are instances in which death is threatened or certain, before the lengthened operation of embryotomy could be completed. Much discussion has taken place as to the relative value of the life of the mother or child in cases supposed to call for hysterotomy, particularly when the child has been sacrificed again and again in the same subject. But, apart from the fact of the great danger to the child in cases of the Cæsarian section, I think the judgment of Dr. Meigs to be in accordance with the dictates of reason and humanity, when he says that this operation should never be performed upon the living subject, save for the preservation of the mother herself, and that it should be considered essentially as a mother's operation, only to be resorted to when the life of the mother is in greater danger from the continuance of labour, than from the hazardous and almost certainly fatal procedure under consideration. The life of the child may be a great consideration *after* the operation has been decided on, but it should hardly enter into our calculations *before* that time.

When a patient has died suddenly, or in any other way, during labour, or in the latter part of pregnancy, there can be no hesitation about the performance of hysterotomy, where the child is suspected or known to be alive. Under such circumstances, the operation should take place as quickly as possible after the death of the mother. It was probably in such cases that the operation was in the first instance performed. I have elsewhere spoken of the performance of gastrotomy in cases of ruptured uterus, where the child has escaped into the peritoneum, and cannot be delivered *per vias naturales*. This operation is also necessary in some cases of extra-uterine fœtation, when death is threatened from the irritation of the fœtus.

Hysterotomy is not a difficult operation. The temperature of the room should be raised, with a view to the prevention of peritonitis, and chloroform administered, unless some special contra-indication exists. The abdominal incision may be made in the direction of the linea alba, or it may be oblique or horizontal, according as the configuration of the abdomen is altered by deformity. The situation of the placental attachment should be avoided, if this organ be attached anteriorly. This may be learnt by auscultation before the operation is commenced. Great care is required in opening the peritoneum, so as to avoid wounding the intestines. The abdominal incision should be from eight to ten inches in length; and the uterine incision should be of nearly the same length. Some have advised that the liquor amnii should be evacuated before the commencement of the operation. When the amnion is punctured through by the uterine incision, care must be taken to let as little of the fluid as possible enter the peritoneal cavity. It is recommended to be removed carefully with pieces of sponge or a syringe. When this has been evacuated, the fœtus is to be taken out cautiously, as in some cases the uterus has grasped the body or neck of the child at the wound, and rendered its extraction a matter of difficulty. The placenta is to be separated by the hand, and hæmorrhage arrested by mechanical pressure, or the application of cold, the risk of peritoneal inflammation being the only objection to the latter. After the removal of the placenta, and the cessation of hæmorrhage, all blood and fluid are to be carefully removed from the peritoneum, and the edges of the uterine and abdominal incisions brought together and maintained by sutures. The external wound is further to be dressed lightly with strapping and wet lint, and the whole supported by a many-tailed bandage, space being left for the exit of discharge. After the operation, large and continued doses of opium, with nutriment and stimulus in good quantity, appear to offer the best chances of recovery. Throughout, every care should be given to the avoidance of peritoneal irritation as far as possible; the escape of the bowels through the wound; and the suppression of hæmorrhage. Dr. Aitken has recommended that the operation should be performed under water, with a view to defend the peritoneum and other structures from contact with the external air, but I am not aware that his suggestion has been carried out in practice. As already mentioned, art and the most careful modes of operating, can do little towards insuring the safety of the patient under hysterotomy. There is one point worthy of consideration which has been already referred to—namely, that patients operated upon in the country have done better than those operated on in great cities; and it is probable that a good air does more than the most skilful surgery in such cases.

I have already expressed the opinion that CHLOROFORM is of very great value in all the more important Obstetric Operations, when no contra-indication to its employment exists. I believe especially, that it enables the accoucheur, under many circumstances, to turn or deliver by the forceps where, but for its use, he would have to resort to craniotomy. Anæsthesia must, it appears to me, be recognised as being quite as important in operative midwifery as it is in operative surgery.

As regards the employment of Chloroform in Ordinary Labour, the current of all experience, since the invaluable discovery of its anæsthetic properties by Prof. Simpson, has been to show its general safety and utility. At its first introduction, I had scruples as to its use, but I have now no hesitation in employing it whenever the pains of labour are severe, and when the patient and her friends desire it. There are, however, certain circumstances which I have seen reason to bear in mind in its administration. Although it is often of very great value in producing sleep and quiet in puerperal mania, I believe I have seen insanity caused after delivery by its liberal employment in some cases. I have also seen it suspend uterine action, and I would therefore be cautious as to its use in cases of uterine inertia or in patients subject to hæmorrhage after labour. Some of the worst cases of laceration of the perinæum which I have seen have occurred in patients delivered under the influence of chloroform. This agent is without doubt useful in relaxing the os uteri and the perinæum. But in cases of rigidity of the perinæum, the existence of pain and full consciousness causes the patient to exert, by the controlling influence of volition, a power over the peristaltic and reflex actions of the uterus and respiratory muscles, which retards the passage of the head to such an extent as to preserve the perinæum when patients are insensible to pain, but retain some amount of consciousness. They will often make greater efforts than usual at the time the head presses on the perinæum, and urge it through the ostium vaginæ with such force as to tear up the perinæum. Greater care, therefore, than usual should be taken when using chloroform, to prevent the too rapid birth of the head.

In the employment of anæsthesia in ordinary labour, the same objections to its use in cases of fatty heart or diseases of the respiratory organs obtain, as those which apply to the general operations of surgery. The anæsthesia need not, however, in the practice of ordinary midwifery, be so profound as in surgical operations or in the operations of midwifery. I believe the best method of administering it is that which is employed by the discoverer of its anæsthetic powers—namely, to pour a little chloroform on a towel or napkin, and suffer the patient to inhale it at the commencement of every pain.

CHAPTER XLVIII.

CONCLUSION.

Having considered the principal subjects which relate to the Anatomy, Physiology, and Pathology of the Reproductive Processes, I propose to devote the present chapter to the causes of the mortality which attends parturition and the puerperal period, and to the modes by which the amount of this mortality may be diminished. The latter forms the end and aim of all improvements in the Theory and Practice of this department of Medicine.

The Seventeenth Annual Report of the Registrar-general of Births, Deaths, and Marriages in England, published during the present year, contains a letter on the causes of death in 1854, by Dr. Farr, the eminent vital statistician, in which the mortality of women in childbearing is very ably handled. From this document it appears that during the eight years from 1847 to 1854, inclusive, to every 10,000 children born alive in England and Wales, 54 mothers died. This makes a maternal mortality of nearly 1 in every 189 deliveries. In the seven years no less than 3232 mothers died, on the average, annually. It is a gratifying fact, that in the seven years the mortality decreased from 60 in 10,000, in 1847, and 61 in 1848, to 47 in 10,000 in 1854. Since 1848 the declension has been progressive, the numbers per 10,000 being 58, 55, 53, 52, 50, and 47. Still, in the most favourable year, 1854, 3009 women died either during childbirth, or in the puerperal period —an enormous fatality to attend the performance of a natural function. The most minute particulars in his report relate to the year 1852. In that year there occurred in this country 617,902 childbearings, and the number of women who perished was 3247. We may at the present time consider 3000 per annum as the number of women destined to perish from childbirth in England and Wales. This mortality, it must be remembered, refers to women in the prime of life, who, up to the time of labour, enjoy excellent health. From the numbers given in the seven years, out of every 100,000 childbearings, 530 women died from causes incident to labour. In the year 1848, 61 mothers died to every 10,000 children born alive. For the year 1852, we have the exact number of childbearings given. In this year 617,902 women were delivered. Of these, 3247 died in childbirth, or in the puerperal period. The estimated number of still-born children was 22,122. The deaths from childbearing bear a considerable proportion to the entire mortality during the childbearing period — viz., from the ages of 15 to 55. Amongst women of the age 15—25, the annual mortality per cent. from all causes was ·861, of which the $\frac{1}{21}$st part, or ·41, is by childbirth. At the ages 25—35, and 35—45, the annual mortality per cent. from all causes was 1·090 and 1·296, of which ·098 resulted from childbirth. Thus between the ages 25—35, 1 in every 11 deaths from all causes is from childbirth. At the age 35—45, 1 out of every 13 deaths is from childbirth, and in the case of women of the age 15—25, the mortality is increased by childbirth in the ratio of 5 to 9. It is difficult to put the mortality from parturition in a stronger light than this. In the English schedule there is as yet no column for the ages of the parents of the children registered. In the Swedish returns this defect does not exist, and Dr. Farr has determined the deaths from childbirth, at the respective ages as they occur in this country, by applying the data drawn from the Swedish tables to our own. The results show that a definite law governs the calamitous deaths of childbirth. Between the ages of 15 and 25, the maternal mortality, as already stated, amounts to 668 in every 100,000, in childbirth. In the second childbearing decenniad, from 25 to 35, the mortality from parturition is only 425 in 100,000 labours. It rises to 633 per 100,000, between the ages of 35 and 45, and to 883 in the last decenniad, namely, from 45 to 55. It is in the first decenniad that the largest proportion of first births occur; but more than one-half of the deliveries which take place at all ages, occur between the years 25 to 35. This is, in fact, the great childbearing epoch, and the age at which parturition is most safely performed. At the age of 15 to 25, one woman out of every sixteen bears a child in the year. At the age of 45 and upwards, the number bearing children is inconsiderable, but from the age of 25 to 35, one woman in every four bears during the year in this country. The most fatal decenniad is the last, between the ages of 45 and 55, when the deaths are more than double the proportion of the deaths occurring in childbirth between 25 and 35. The female population between the ages of 45 and 55 is estimated at 782,010; of these, 7545 are computed to bear children in the year, and a fatal result occurs in 66 cases, or at the rate of ·883 per cent. The comparative mortality in the four decenniads may be represented by the figures 3, 2, 3, and 4. This increase in the mortality from parturition at the two extremes of the childbearing epoch is in accordance with the results of common observation. All radical defects and deformities in the childbearing organs are tested in first pregnancies, and it is in the first and last periods that rigidities of the soft parts are most marked. Towards the end of the childbearing period, women then becoming pregnant for the first time have their peculiar dangers; while in women who have borne numerous children, and in whom the reproductive organs are worn out, as it were, the results of uterine inertia, and the occurrence of rupture of the uterus, from its imperfect development in later pregnancies, increase the mortality. Other affections, such as fibrous tumours and mollities ossium, also increase in importance as impediments to labour, towards the close of the childbearing epoch. It may be observed that in all returns relating to obstetrics, the amount of mortality from causes connected with childbearing are rather under than over stated, from the natural repugnance of practitioners to refer to this condition as a cause of death.

If we come to inquire into the special causes of death from parturition, we find Metria or Puerperal Fever to be the monster source of childbirth mortality, when compared with any other single disease or accident attending labour. In the eight years 1847-55, 25,868 mothers died in childbirth; of these, 8154 perished from puerperal fever. More than 1000 women die annually in England from this cause alone. The particulars of this are set forth in the following table:—

Deaths of Women in Childbirth in the Eight Years 1847–54.

YEARS.	Number of deaths from			Deaths of mothers to 10,000 children born alive.
	Metria and other causes.	Metria, or puerperal fever.	All other accidents of childbirth.	
1847	3226	784	2442	60
1848	3445	1365	2080	61
1849	3339	1165	2174	58
1850	3252	1113	2139	55
1851	3290	1009	2281	53
1852	3247	972	2275	52
1853	3060	792	2268	50
1854	3009	954	2055	47
8 Yrs., 1847–54	25868	8154	17714	54

After puerperal fever, hæmorrhage and exhaustion, the operations of midwifery, rupture of the uterus, puerperal mania, and convulsions, are the principal causes of death. Certain diseases quite distinct from parturition, such as small-pox or scarlatina; and visceral inflammations, such as idiopathic peritonitis, cardiac, pulmonic, and cerebral inflammations, are vastly increased in danger by the concurrence of pregnancy or parturition. Statistics yield some interesting and important facts respecting the ages at which metria and the other disorders and accidents of childbirth are fatal in different proportions. These facts are exhibited in the following table:—

Comparative Mortality of Women bearing Children at different Ages, from Metria and all other Causes, in the Seven Years 1848–1854.

Age of mother.	Deaths by metria.	Deaths by other accidents of childbirth.
15 — 25	 2085	 2939
25 — 35	 3401	 6378
35 — 45	 1791	 5566
45 — 55	 86	 380
15 — 55	7363	15,265

Thus it appears that during the first childbearing decenniad, 15—25, somewhat more than two-fifths of the childbed mortality is from metria or puerperal fever; but under this head all inflammatory disorders of the uterus are probably included. In the second decenniad, 25—35, rather more than one-half of the deaths of women in childbirth are attributable to metria. In the third decenniad, 35—45, rather less than one-fourth of the deaths take place from metria, the proportion being 1791 from fever to 5568 from the other accidents of childbirth. In the limited number of cases occurring in the fifth decenniad, a still smaller proportion of deaths from metria is observed. It results that between the ages 15—35, women are greatly more susceptible of puerperal fever than between the ages 35—55. On the other hand, while between the ages 35—45, and 45—55 the chances of death from puerperal fever are diminished, those of death from the other accidents of childbirth are increased in a still greater proportion. The great era of puerperal fever is before the age of 35, when it exceeds one-third of the total deaths from childbirth. After the age of 35, the other accidents and disorders of childbirth largely exceed puerperal fever in importance, the proportion in the seven years being 5998 from the ordinary accidents and disorders of childbirth, and only 1877 from metria. I am not aware that the attention of obstetricians has ever before been drawn to these remarkable facts in connexion with death from childbearing. That they have a practical bearing of the first importance, is at once obvious.

We have seen that the great single cause of death amongst childbed women is Metria, or Puerperal Fever. There can scarcely be any hesitation in declaring that this disease ought hereafter to be as absolutely extinguished in this country as the plague of former times! It stands in the same category as typhus, and the rest of the zymotic diseases, which we may reasonably hope are in gradual process of extinction by preventive medicine. This extinction, if possible, cannot but be hastened by the earnest direction of the professional mind to the subject, since it is one which is very much within the control of medical men. As regards cure, or effective treatment, the disease in its various forms is utterly beyond all the known resources of our art; and there is no reason to imagine that we shall ever deal with it effectually, save in the way of prevention. In this point of view, everything in the history of the disease leads us to the conclusion that its virulence and frequency may be moderated to almost any extent, and that it may even, in process of time, be entirely annihilated.

And, first, as regards the Sporadic origin of this disorder. The state of the lying-in woman is one in which, as we have seen again and again in the present Chapters, the blood and secretions are necessarily vitiated to a certain extent. Puerperal fever may almost be produced at will, by crowding a number of lying-in women together in the wards of a lying-in hospital. It is generated in individual cases, by inattention to the lochial and other secretions, the absence or neglect of ventilation, in the small rooms of the poor, where the lying-in chamber is often the abode of the rest of the family, and is used for all domestic purposes. In fact, where there is risk of typhus to the non-gravid woman, there then is more than an equal amount of danger of metria to the puerperal woman.

In the way of Infection and Contagion it may, I think, be demonstrated, that puerperal fever may be carried from one patient to another by the proximity of lying-in patients, and by attendants and nurses conveying the infectious principle from one patient to another. There can be no doubt whatever that the exposure of a lying-in woman to the influence of the fomites or other impalpable or material agencies, derived from erysipelas, typhus, hospital gangrene, scarlet fever, small-pox, decomposing animal bodies, especially of persons who have died from any form of fever or inflammatory disorder, and other conditions, conveyed to the lying-in woman by the breath of those about her, or the hands and clothes of her attendants, will produce the disease. When the disease prevails in lying-in hospitals, and acquires a certain virulence, it is apt to prevail epidemically, all the lying-in women exposed to the danger becoming affected; and it is believed to prevail in certain districts and seasons, as an epidemic apart from all influences of contagion and infection.

The prevention of Sporadic cases belongs in part to the general sanitary questions of dwellings for the poor, draining, ventilation, water-supply, and other matters bearing upon the physical condition of the poorer classes of society; and in part to the attention given to cleanliness, the removal of morbid secretions, and other removable causes of disease, in individual cases. As regards lying-in hospitals, it may be questioned whether they have not proved in many respects an injury, instead of a blessing, to those classes they are intended to relieve, and certainly I believe the feeling of the profession is against any extension of the system of lying-in hospitals. They have demonstrated more emphatically than the facts derived from any other source, that puerperal fever is a contagious and a preventible disease. A large amount of the mortality from puerperal fever in large cities has occurred within their walls, and from these institutions it necessarily spreads by medical attendants, nurses, patients, and wet-nurses, to other lying-in women. It is evidently unsafe to congregate lying-in women, in any numbers, in the same building. This is the opinion of Dr. Robert Lee. Dr. Simpson has suggested that lying-in charities should consist of detached buildings rather than of hospitals. Dr. Ramsbotham declares himself very emphatically against such institutions, and relates that he once refused a valuable appointment in a proposed new charity of this kind. Drs. Lever and Oldham, when the managers of the splendid income of Guy's proposed to erect a new lying-in hospital, exerted their influence against the origination of such a building. Dr. Copland, who for a long time held an appointment as consulting physician to a lying-in hospital, has given a very emphatic opinion respecting the dangers arising from such institutions. There can be little doubt that the suppression of such hospitals would effect a great saving of human life. No care that ever yet has been devoted can render the mortality in lying-in hospitals in this country as favourable as the mortality amongst women confined under the most miserable circumstances at their own homes. Meantime, while lying-in hospitals exist, every care should be given to the ventilation of the wards, the allotment of sufficient space to each patient, and the removal of infected patients to separate wards. It has always been the laudable practice, when puerperal fever has prevailed in lying-in hospitals, to shut up infected wards, or to close the institutions altogether. What applies to lying-in hospitals, holds good also with respect to the admission of lying-in patients into the wards of general hospitals.

As regards the care of individual childbed women with reference to the sporadic development of metria, much depends upon the nurse. It is in this respect of the highest importance to have trained and educated nurses, understanding the subjects of diet and ventilation, and made well aware of the importance of cleanliness in all that relates to the management of the lochial and lacteal secretions. I have already referred to the relation of questions of drainage, the construction of dwellings, and other sanitary matters, to the sporadic production of puerperal fever. In this particular concern our profession is at present very much at the mercy of the public. We are not responsible for the great causes of zymotic disease which exist. With the improvements in our sanitary arrangements, puerperal fever will diminish like other diseases of the same class, or become far more easy of prevention.

When epidemic puerperal fever, or the conditions which give rise to it, exist, what can be done to prevent its development or extension? It has been proposed to keep lying-in women in suspicious circumstances, constantly under the influence of quinine, iron, or some other tonic or antiseptic remedy. But the extent of the powers of such medicines are matters rather of reasonable supposition or belief than of actual proof. I should be disposed to place great confidence, from what I have seen of its use, in the chlorate of potash as a prophylactic against puerperal fever, in doses of from five to ten grains three times a day. This drug appears to act by liberating in the economy the oxygen and chlorine it contains.

In considering the spread of puerperal fever by Infection and Contagion, the different circumstances under which the poisonous element is circulated must be borne in mind.

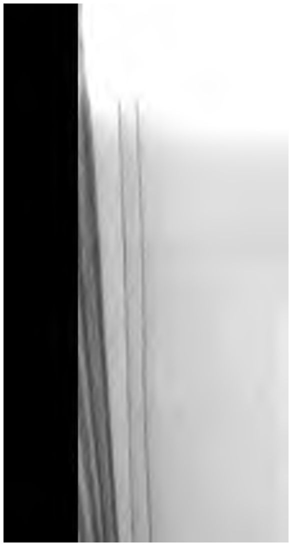
It is obvious that women who are in the latter months of pregnancy, and in whom delivery may be expected from day to day, should be secluded as far as possible from proximity to patients suffering from the exanthemata, erysipelas, hospital gangrene, scarlet fever, putrid sore-throat, or any other disorder the miasm of which admits of conversion into the puerperal poison, and that any indirect communication by third parties or in any other way should be prevented to the greatest practicable extent. The relations of Medical Men, Students, Midwives, and monthly Nurses, to the propagation of puerperal fever, require separate notice.

According to the present arrangements of our profession, there is no class of medical men exempt from the risk of conveying to puerperal patients, infectious or contagious matters from disorders capable of producing metria. Those who practise midwifery as a specialty, may meet with sporadic cases of puerperal fever capable of furnishing infectious matter, or they may be called to see cases of puerperal fever in consultation. Men holding hospital or dispensary appointments are also obliged to see the puerperal patients of such institutions. Surgeons in general practice, necessarily attend cases of infectious disease, convertible into metria, when conveyed to the lying-in woman. Surgeons holding hospital appointments, who perform operations and practise midwifery, as Dr. Simpson has forcibly pointed out, have to deal with lying-in women, and also with cases of an infectious and contagious nature, such as phlebitis or erysipelas. If students attend midwifery cases while their anatomical and surgical education is going on—and it is difficult to seclude themselves entirely from such subjects—they unavoidably expose patients to the risks arising from their dissections; from their attendance upon medical and surgical hospital practice; and also their pathological studies. Midwives frequently convey the disease from one patient to another, and the same may be said of monthly Nurses.

Since it is impossible, or next to impossible, considering the frequency of infectious or contagious diseases, for any man in practice to escape entirely from the risks of infecting or inoculating lying-in women, especially when such patients are under circumstances favourable to infection or inoculation, the question arises as to the best mode of rendering these risks nugatory, or of destroying them altogether. In the Chapter on Puerperal Fever I have given the evidences which appear to me to prove that the blood and breath of the practitioner is a very common medium of infection. This would point to the propriety of neither going nearer to, nor remaining longer in, the vicinity of a patient suffering from puerperal fever, or any convertible infectious disease, than is necessary; and of not approaching so near to a recently delivered woman as to expose her to danger from the breath. Where the presence of infection is very evident, the propriety of changing the clothes is obvious, and generally practised; and many expose their clothes to the fumes of chlorine after exposure to risk. After touching any wound or purulent surface, the hands should be not merely washed, but washed in a solution of chloride of lime, or some other disinfecting fluid. It would only result in good and in confidence on the part of patient and practitioner, were the practice common, if the hands were habitually washed in a solution of chloride of lime before attending a labour, and, in suspicious circumstances, before and after every vaginal examination. The fingers of the practitioner are evidently a fertile source of contagion. Dr. Simpson compares the fingers of an accoucheur who has been touching wounds or pathological specimens to the armed points used in vaccination. The small amount of matter conveyed by the hand, which is capable of producing disease, is almost incredible. A practitioner has been known to have an outbreak of puerperal fever in his practice,—to have freed himself by absence from home, so as to have attended cases without risk,—and then to have had a second outbreak after wearing a pair of gloves which he had worn during the first attack. It has been recommended that gloves should not be worn at all by accoucheurs, and certainly, considering the interests at stake, no precautions can be too minute under circumstances of suspicion. Keeping the nails closely cut, is another point worthy of attention. The condition of the utero-vaginal canal is, it must be remembered, the most favourable which can be conceived, for inoculation. The mucous surfaces are in a state of high excitement; abrasions and slight lacerations of the vagina and perinæum are extremely common. The removal of epithelium from the surface of the os uteri, at the time of labour, is almost universal, and it is to this part, of course, that the finger of the accoucheur is necessarily directed during his examinations. With respect to the attendance of students on cases of midwifery, some time ought to be set apart for their attendance upon midwifery cases, during which they should neither dissect nor attend the wards of the hospital, or the deadhouse. The dangers arising from the attendance of students upon lying-in women, when they are dissecting and attending autopsies, is exhibited in the most startling form by the statistics of the great Vienna lying-in hospital. In this institution, in the six years from 1840 to 1846, 22,120 women were delivered. Of these, 2260 died; the mortality being in the enormous ratio of 1 in every 10. The mortality has since been reduced to 1 in 74, and the reduction has dated from the time when Dr. Semelweiss enforced the regulation that every student should, before and after each vaginal examination, wash his hands in a solution of chloride of lime, and also interdicted the students from touching dead bodies.

As regards the deaths arising from accidents and other disorders during childbirth, there is also much hope of diminishing the amount of mortality. Everything points to the importance of only allowing qualified persons or advanced students to attend women in parturition. In no other circumstance or operation whatever, where the mortality was 1 in 189, would ignorant women or unqualified persons be allowed to practise. The common feeling has been, that any one might safely attend a woman in middle life who had already borne children; but the tables I have given show that rather more than 800 women perish in England yearly from the various accidents and diseases of childbirth, between the ages of thirty-five and forty-five. The attention and anxiety of practitioners are commonly given to first labours; but statistics show unerringly that the greatest and most fatal risks from accidents, &c., attend the delivery of women who are mothers of families, and above the age of thirty-five. It is in these women that death occurs most frequently from hæmorrhages, puerperal mania, rupture of the uterus, exhaustion, &c., while they are comparatively exempt from the danger of puerperal fever. On the other hand, our care in guarding young lying-in women from their greater risk of taking metria should be most unceasing. The proportion of deaths from hæmorrhage are very large. As far as the statistics from which I have quoted are available, the deaths from flooding alone are more than 10 per cent. of the total deaths in childbirth. Now, there can be no doubt that, with the appliances and means we at present possess, this large item of childbed mortality might in the hands of educated obstetricians be greatly diminished, and that death from flooding ought rarely to occur. Another large reduction might be made by substituting the induction of premature labour, or turning, or the forceps, but especially premature labour, for craniotomy. By the employment of turning or the forceps, the mortality is considerably diminished; but by the induction of premature labour the risk of death to the mother from the performance of craniotomy becomes very slight indeed. We have seen that in almost all cases the induction of abortion or premature labour might, by the exercise of foresight, be substituted for craniotomy. Taking the annual number of deliveries—the proportion of craniotomy cases—and the scale of mortality from this operation, we have the data for an approximative estimate of the maternal mortality caused by craniotomy in England. This would amount to nearly 400 deaths per annum from this cause alone, all or nearly all of which might undoubtedly be averted. The judicious use of chloroform, especially in serious obstetric operations, will no doubt tend to the diminution of childbed mortality.

In concluding the present work, I cannot but look forward to the time when the present mortality from childbearing will be greatly lessened. This is a subject in which we of the present day must bear our part, and it is consolatory to know that every succeeding generation of students and practitioners will come to the work with added means of science and experience, until at length we may hope that no unnecessary mortality shall take place in parturition.



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